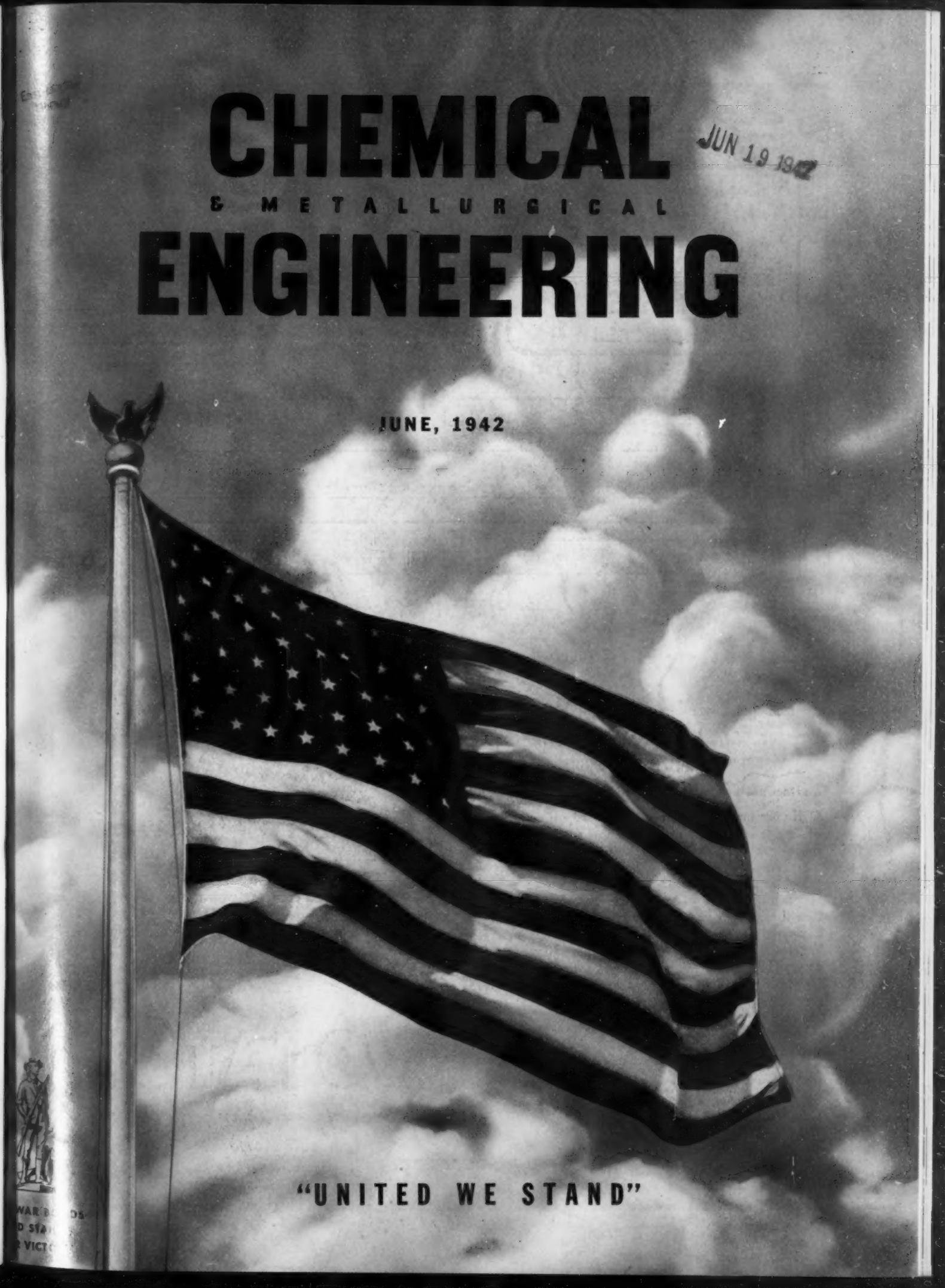
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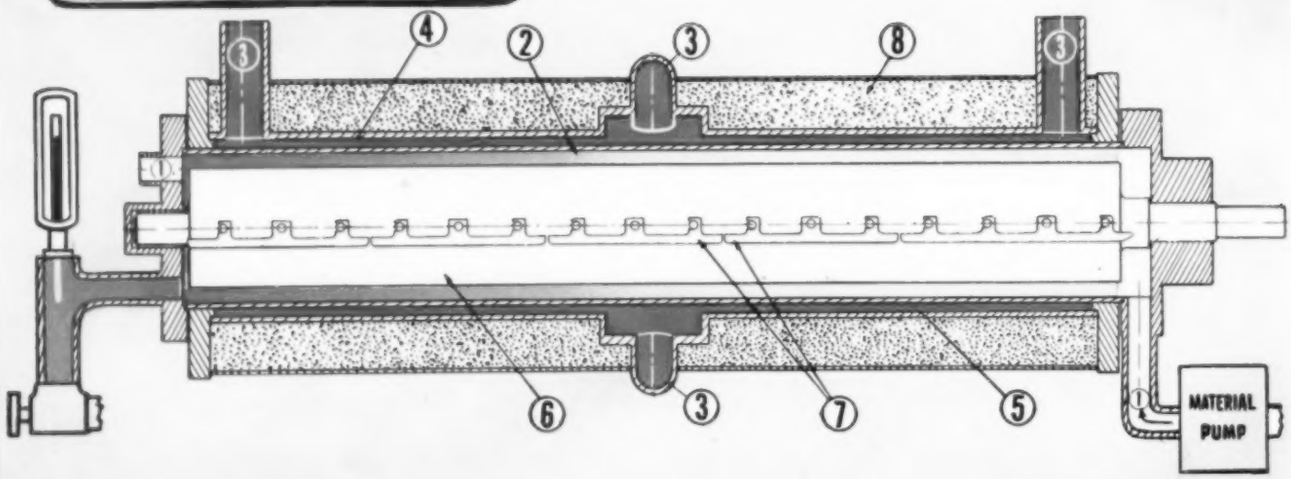
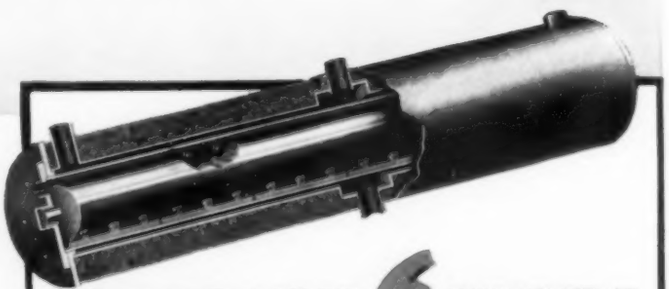


* SEE KEY TO VOTATOR FLOW DIAGRAM



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That our flag should have our deepest and most intelligent respect, particularly now, goes without saying. To help promote more nearly uniform observance of the proper manner of displaying and saluting the flag, our government has approved the use of the Flag Code adopted by the National Flag Conference held in Washington, D. C. May 15, 1924. Illuminated copies of this code, suitable for framing or posting, will be sent free on your request to the editors of *Chem. & Met.*

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CHEMICAL & METALLURGICAL ENGINEERING

ESTABLISHED 1902

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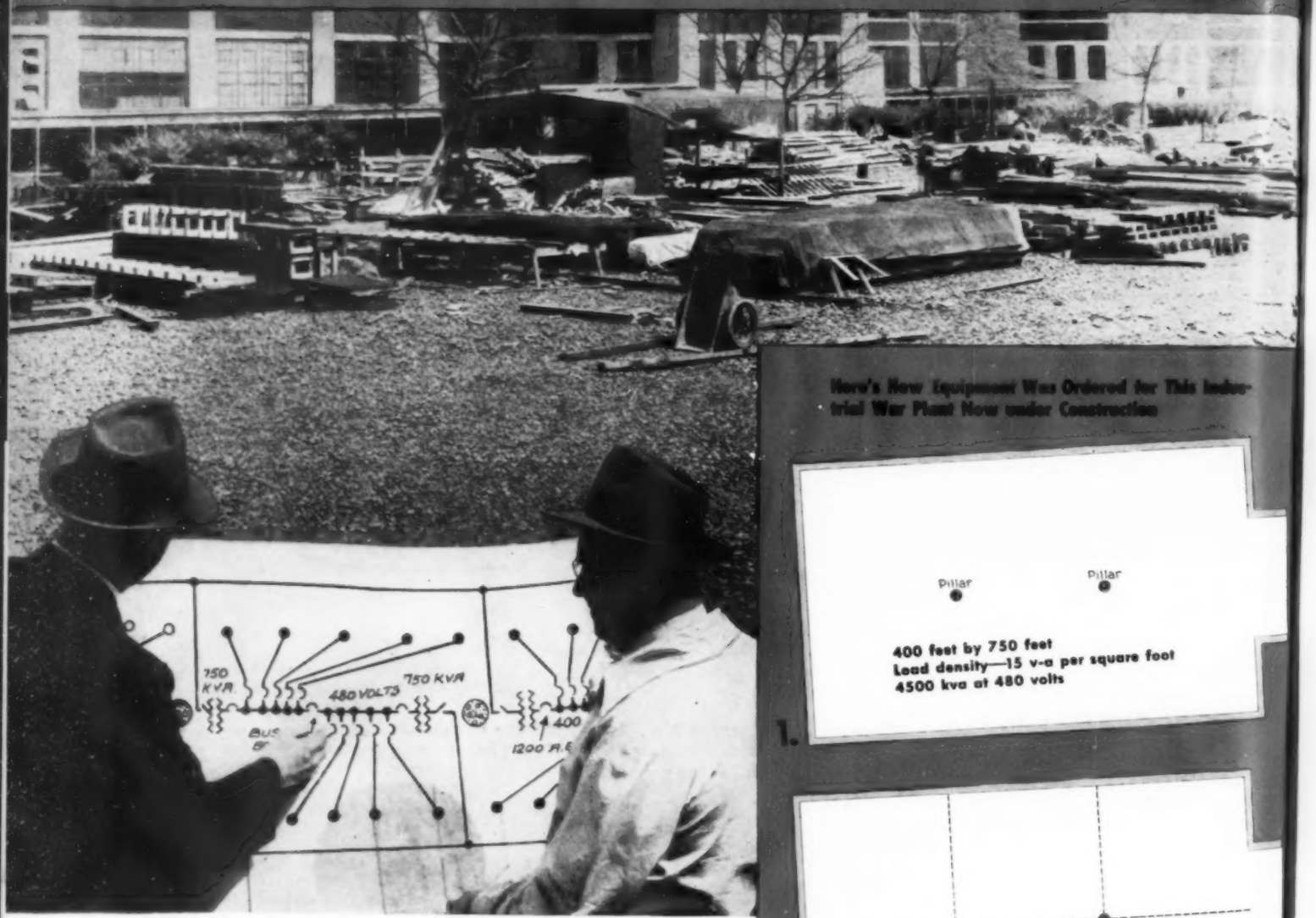
How to PROVIDE PLANT POWER QUICKLY



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1. ***Calculate the total kva you need*** Load densities commonly range from 5 to 25 volt-amperes per square foot of floor area. Assembly areas usually fall in the lower range, intensive manufacturing areas in the upper range. Your consulting engineers can help you to predict your load density accurately.

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3. ***Divide the load of each zone into feeder loads***—and draw a one-line diagram of your proposed load-center system, showing the functions to be performed and the ratings required.

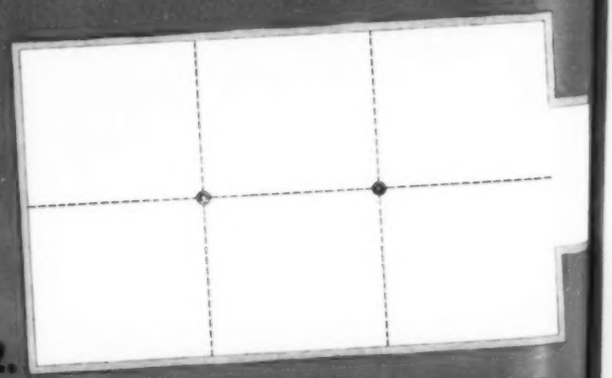
Now, with this one-line diagram, you can immediately order your switchgear and unit substations.

Here's How Equipment Was Ordered for This Industrial War Plant Now under Construction

1.

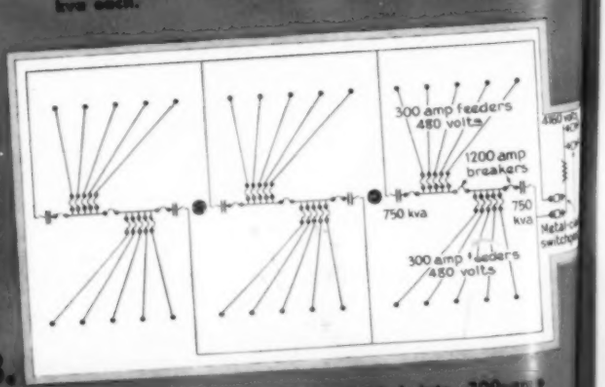
400 feet by 750 feet
Load density—15 v-a per square foot
4500 kva at 480 volts

2.



The load area was divided into six load zones of 750 kva each.

3.



The load of each zone was divided into 300-amp feeders, each zone having 1200-amp breakers for main and bus-tie service. Equipments were ordered promptly by means of a one-line diagram.

CHEMICAL & METALLURGICAL ENGINEERING

ESTABLISHED 1902 S. D. KIRKPATRICK, *Editor*

JUNE, 1942

STAND BY FOR FURTHER ORDERS!

WE FIND increasing uneasiness among young chemical engineers who have difficulty in seeing how they are actually helping in the war effort. Some of them feel they should throw overboard their technical and professional training in order to enter the armed forces. A still larger group would like to go to work for the government in some chemical engineering capacity, or to transfer to a more essential type of industrial employment, yet to do so they feel they may be accused of merely seeking to dodge the draft. Nothing could be farther from the truth.

Chemical engineers in any kind of war work—and that includes a great many activities beside making munitions—are probably serving the Nation better in their present jobs than they would in almost any capacity with the Army or the Navy. Chemical engineers working in other than war industries should continue where they are in preparation for the time when greater numbers of experienced men will be needed and cannot be obtained except by transfer from existing industries. Just as the distilling industry has been completely converted to war production, so there will be an inevitable switch-over to war activity on the part of most of our other chemical and process industries. Meanwhile the men working in these plants form the only real chemical engineering reserve we have in this country. They should be kept in active training in their chosen profession. This means, of course, that the individual should not only work as hard as he can at his regular job, but should try actively to improve himself in other lines of chemical engineering which he, himself, can recognize as of increasing importance in the war effort.

Dean Frank C. Whitmore of Penn State, who has become a past master in educating local draft boards, likes to call their attention to just two figures, viz., 27 millions and one-quarter million. The first refers to the total number of men up to 35 years of age who have registered in the Selective Service System. The second number is slightly greater than the present total enrollment of the National Roster of Scientific and Specialized Personnel, which includes chemists, physicists, chemical engineers, bacteriologists, geologists and other scientifically trained men from the graduating classes of 1942 up to the age of about 80 years. If we are to lose this war, he holds that it will not be because of the 27 millions but because the quarter million is either too small or we have not used it as effectively as we should.

Of the quarter million only about 60,000 are chemists and chemical engineers. The fact that even during the worst days of the depression only about a thousand of these were ever unemployed would seem to prove that they are needed to carry on the normal peace-time operations of the country. But the tremendous expansion of chemical and metallurgical industries and the intensive application of war research and development now call for a much larger proportion of technically trained men. When the new synthetic rubber, magnesium, aluminum and like munitions plants get into full swing in 1943, the number of chemical engineers needed for supervision and control will be far in excess of the available supply, even with the complete diversion of those still engaged in fields not directly connected with the war program. So it is vitally important that we have no more voluntary desertions or actual robbing of the chemical engineering ranks, motivated by misguided patriotism on the part of local draft boards or the recruiting officers of the Army and Navy.

Fortunately, there seems to be no such misconception or confusion in this matter in the attitude of General Hershey and his ranking associates in Selective Service Headquarters in Washington. Likewise the public utterances of Administrator Paul V. McNutt, chairman of the War Manpower Commission seem to hold promise of a far better appreciation of the key importance of the technically trained men on whom the war machine

depends for its design, construction and operation. And, finally, there is the tiny, but gradually growing idea of a technological high command to muster all of our scientific and engineering resources for war roles of technology. So, in the welter of confusing counsel, we urge that chemical engineers should stand by their guns a while longer. New orders of attack are in the making.

PATENTS AND RE-SALE PRICES

PATENTS are not yet a "lost art" but, under recent court decisions, they seem to have less value than formerly. Certainly the Supreme Court in a case decided May 11 makes it clear that a patent does not in any way extend a right to control re-sale prices.

The case in question had to do with multifocal eye-glass lenses. But it might just as well have been some industrial chemical. The producer sold his patented product to distributors under contracts which attemped to do two things: first, the contract gave a license to utilize a patented method of processing: second, the contract prescribed the price at which the finished product should be sold to the wearer of the eyeglasses.

The Supreme Court of the United States in this case says that by sale of the article made under a patent, the owner of the patent clearly has exhausted his monopoly. The court repeats what it considers a long-time policy fixed by all United States courts, that the right to control stops when the ownership of the patented article passes to the customer.

Those who seek to maintain re-sale prices of their trade-marked and nationally advertised goods must, therefore, fall back on the Miller-Tydings Act as their sole authority in federal statutes. When they cannot clearly meet the conditions of that law, they will be regarded by the courts as violating anti-trust statutes whenever they undertake to control re-sale prices. There seems to be no hope for exception from this generalization in the Court's finding, regardless of whether the patent be on a chemical product, a device, or a process of making either.

COOPERATION OR COLLUSION?

BETWEEN patriotic cooperation and illegal collusion, the line is very vague. This is unfortunate. Many worthwhile efforts that would save scarce goods or services are not being made because of this doubt in the minds of thoughtful industrialists.

It was hoped that the President's admonition to Assistant Attorney-General Arnold would result in the laying aside for the duration of zealous prosecutions which try to make criminal acts out of every cooperative gesture of industry. But this ardent trust buster is not to be deterred, even by the President's implied warning. Industry must, therefore, frequently take a chance on apparent violation of the law in order to get things done.

There remain only a few activities which Mr. Arnold does not question. The work of technical committees, the formulation of specifications, and most of the types of constructive trade-association activities are rarely attacked. Not so, however, with many other highly desirable efforts.

Right now the chemical industry must, despite this difficulty, try to find some way in which to cooperate in handling goods in transport. The shortage of transportation is so serious that the industry may have to take the chance of incurring Mr. Arnold's wrath in order to move goods that are absolutely vital to the war effort.

Such cooperation may often become practicable, and legally defensible, if care is taken regarding negotiations and arrangements. In planning transportation, every step should be taken in close cooperation with and with the official knowledge of the Office of Defense Transportation. O.D.T.-Boss Eastman must be asked to furnish technical aid, both to protect the industries and to see to it that each industrial effort harmonizes with the comprehensive national program. And tentative agreements so reached can then be submitted with some assurance to the Department of Justice for review and criticism.

Similar arrangements with respect to the sharing of raw materials must be made in cooperation with the W.P.B. Some governmental agency must be drawn in early in all cooperative efforts. Even then Mr. Arnold may not be happy. But we still believe, and certainly hope, that the Federal Courts will not share Mr. Arnold's zeal in undertaking to make every cooperative effort an illegal thing *per se*.

MANPOWER CONSERVATION

IN THE nation's drive for war production, we sometimes think of time and material as the only irreplaceable factors that limit the output of our machines. We lose sight of the fact that last year a rising toll of accidents claimed the lives of 101,500 persons, permanently disabled another 350,000 and injured 3,750,000. In terms of production, industry last year lost, from accidents alone, 460,000,000 man-days of work. That is enough time and energy to have built twice as many battleships as are to be found in the American and British navies combined. To cut that toll by 20 percent, which is well within the experience and expectancy of a well ordered safety program, would buy us ten battleships of the "North Carolina" class, 2,100 Flying Fortress, or 600 heavy tanks.

No wonder Donald Nelson has gotten squarely behind President Roosevelt's proclamation calling on the officers and directors of the National Safety Council "to mobilize its nation-wide resources in leading a concerted and intensified campaign against accidents and to call upon every citizen in public and private capacity to enlist in this campaign and do his part in preventing wastage of human and material resources of the nation through accidents." No wonder that a group of the nation's leading industrialists, under the chairman-

ship of W. A. Irwin, former president of U. S. Steel, have organized a program to extend the safety drive on all fronts. No wonder that Benjamin O'Shea, president of Union Carbide & Carbon Co., agreed to head the Chemical Division Committee and thereafter quickly enlisted the interest and support of a score of other prominent executives in our industries. Thus is the vital importance of manpower conservation recognized by industrial management.

The goal of the War Production Fund to Conserve Manpower is $5,000,000. Compared with the $750,000,000 which we have good reason to believe can be saved through accident reduction next year, this is a trifling sum—less than 1 percent of the benefits to be gained. But the ultimate goal will not be reached unless and until it has the moral as well as the financial support of every company in our industry. Your help and cooperation in presenting this matter most intelligently to your executives and directors will be greatly appreciated by Mr. O'Shea and the Chemical Division Committee.

WASHINGTON HIGHLIGHTS

CHEMICAL INDUSTRIES get a superior priority aid from the most recent amendment to Preference Order P-89. This allows the chemical maker to use an A-1-e rating on 30 percent of the dollar value of his required regular supplies. An A-3 rating is applicable to the remaining 70 percent. The supplier of the materials can extend the A-1-e rating backward to the source of the goods so involved. Officials emphasize, however, that chemical makers must use discretion in requesting the higher priority only for goods most difficult to secure. Otherwise they may not be able to get the balance of their requirements at the A-3 level.

MANPOWER PRIORITIES will probably involve the rating of individual plants according to their importance in the war program. Just how this will be accomplished to guide the War Manpower Commission had not been announced at the end of May. But it is evident that each essential chemical industry will have to see that it gets a reasonably high rating or its employees may be stripped away by other enterprises having better manpower priority. A great many difficulties in administering this feature of the manpower program are anticipated. But Washington is determined that transfer of skilled employees from less important to more important enterprises will somehow be assured.

PRICE CEILINGS for certain industries are fixed independent of the General Maximum Price Regulation Order of O.P.A. Approximately 150 industries retain such specific ceiling rules and a few, including fertilizer, have had new industry rules established since the general plan took effect. Other chemical industry groups which require such specific orders can appeal with some hope of sympathetic attention by O.P.A. The effort is to set such specific ceilings only where necessary to eliminate injustice or public disadvantage.

"ROLLED-BACK PRICES" were first authorized for the benefit of tanners of sheepskin. This unit of the leather-making industry was squeezed between the rising cost of pickled sheepskin and the ceiling price on finished leather. To prevent leather prices from breaking through the ceiling fixed by the general order, thus also causing price rises for leather goods, O.P.A. did the unexpected. It reached back into the raw-material levels and lowered prices there to the basis of the quotations of October, 1941. Thus, a profit margin is re-established for the tanners without affecting the cost of living. Comparable action to eliminate difficulties in other industries is promised by O.P.A. on all important and meritorious cases.

RE-USE OF CONTAINERS is now encouraged. Even some types which previously had been authorized by I.C.C. only for single-trip use can now be re-used until weakened to the point of hazard. Where specific authorization has not been given for this, there is little difficulty in getting a prompt approval through either the Manufacturing Chemists' Association's office in Washington or by direct action with I.C.C. on cases which are of interest to but a single company.

SOAP MAKING extremes have developed during the last few months, somewhat to the embarrassment of Washington. There had been some talk that old-fashioned home manufacture of soft soap from household waste grease should be undertaken. This idea is definitely discouraged, both to save lye and to make the grease available for glycerin recovery. Commercial soap makers went on a manufacturing spree during the first part of 1942 and Washington expects something may have to be done about it by W.P.B. In the effort to maintain glycerin supplies the production of soap was far above the average rate. Officials are now worried lest huge inventories of soap, in the trade and in the household hoard, build up and then suddenly the soap industry may find itself without market. In that event, a sharp cut in production of soap with disastrous curtailment in glycerin manufacture would be inevitable.

PATENT CONTROVERSIES of the most bitter type raged during most of May in the Senate before the Bone special subcommittee. The Department of Justice continues to press its idea that patents have been used to restrict war production. Its proposals for remedial legislation (Senate Bills 2303 and 2491) are the basis on which this very radical committee is proceeding to use the hearings as a megaphone through which to shout its ideas of reform. Chemical engineers are urged to study these bills and to communicate their views to their senators and congressmen. Copies may be obtained from A.I.Ch.E. Secretary Tyler, 50 E. 41st St., New York City.

PLASTICS MAKERS are going to cooperate with the Federal Government in formulating better test methods and improved emergency standards for specifications of purchase. The immediate purpose is to facilitate war-time buying by the government of parts needed in war equipment. The long-range benefit expected is both a better quality of plastics and a more realistic selection according to actual performance. Elimination of tests which tend to emphasize one variety of plastics unduly may thus be achieved, to the mutual benefit of the industry as a whole and the user of plastic products.

Why We Must Make More Synthetic

O.E.M. photo by Palmer

This sheet of synthetic rubber coming off the rolling mill at the Akron plant of the B. F. Goodrich Co. is now ready for drying and further compounding

RAYMOND CLAPPER, in a recent news column, said: "The synthetic rubber program for this year and the next is the biggest job of chemical engineering ever undertaken in the world. To crowd it into the tight situation with regard to construction materials will require one of the most ingenious jobs of puzzle-solving that American industry has ever faced."

It is our problem and it must be solved if America is to win this war! Our armed forces must have rubber. A 35,000-ton battleship requires 150,000 lb., a medium tank 1,750 lb., a Flying Fortress, 1,246 lb., an army gas mask 1.81 lb. and we need 1,500,000 of them immediately. So it goes. Rubber is indispensable in modern war. We have vital need for every pound we can get from every source. Every available bit of scrap rubber must be reclaimed. Every geographical source of supply for the natural product, not now in the hands of the enemy, must be drained to the limit. And still we must depend in a very large measure on a tremendous and rapid expansion in our production of synthetic rubber.

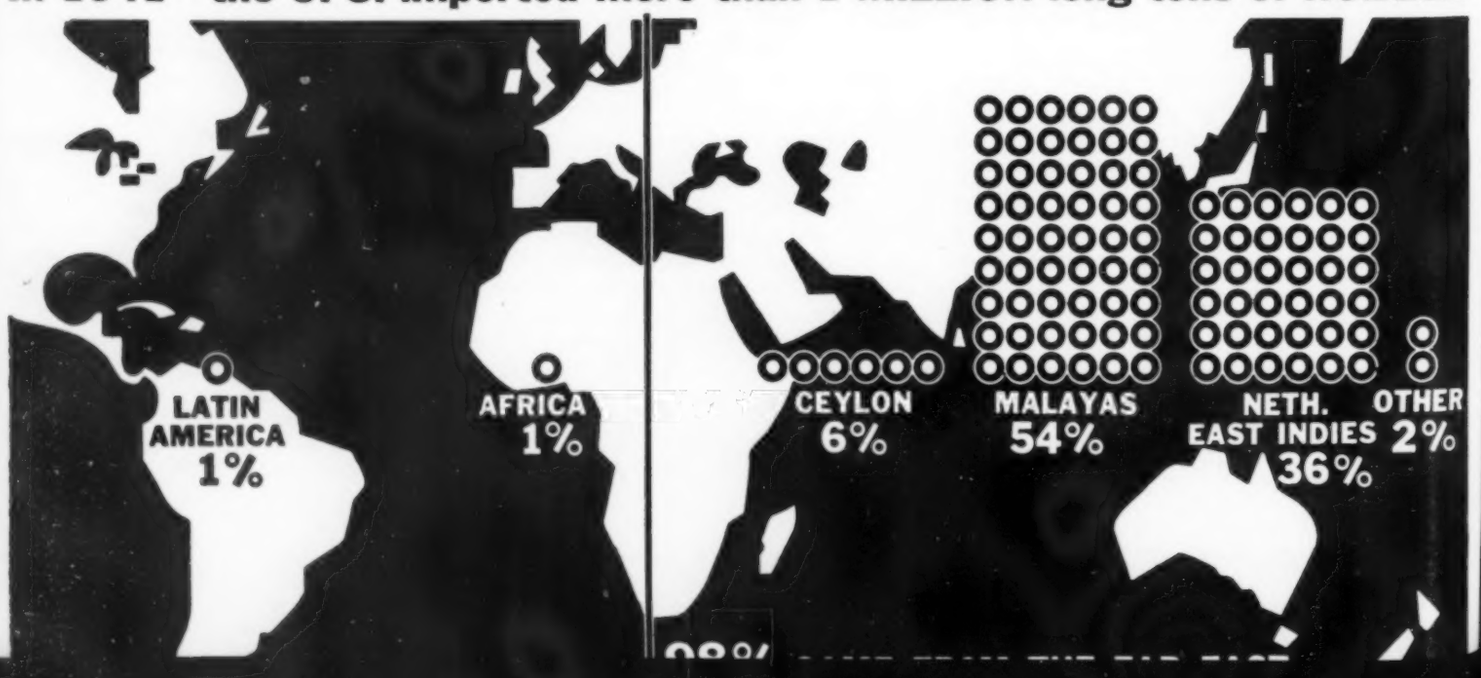
The War Production Board, early in May, set a goal of 800,000 tons of synthetic rubber as the production *rate* to be reached by the end of 1943.* Of this total, the production of Buna-S is to reach an annual *rate* of 700,000 tons before the end of next year. The balance of our 1943 production capacity is to be made up of 60,000 tons of Butyl rubber and 40,000 tons of Neoprene. But reaching such *rates* of production is far simpler than actually producing that much rubber in a year. The best the W.P.B. program envisions now is production of 350,000 tons during the calendar year 1943. That in itself is a five-fold increase over the maximum rate expected to be attained late in 1942 when 40,000 tons capacity in the government-owned plants will be added to the 30,000 tons in the now privately-owned plants.

Money becomes less and less important as this program advances. Jesse Jones' original estimates of $1,000 per annual ton of capacity will probably fall far short of the actual expenditures. Some believe that the total cost of raw-material and polymerization plants will exceed a billion and a quarter dollars.

The principal raw materials and the important steps in the production of the chief types of synthetic rubbers are shown in the accompanying flowsheets. These simplified charts were prepared by the Standard Oil Development Co. and distributed to the press on May 22 in connection with an announcement of an improved process for produc-

*On May 21 Jesse Jones "raised the ante" to a cool million tons of which the additional 200,000 tons will have to come from grain alcohol.—*Editors.*

In 1941—the U. S. imported more than 1 MILLION long tons of RUBBER



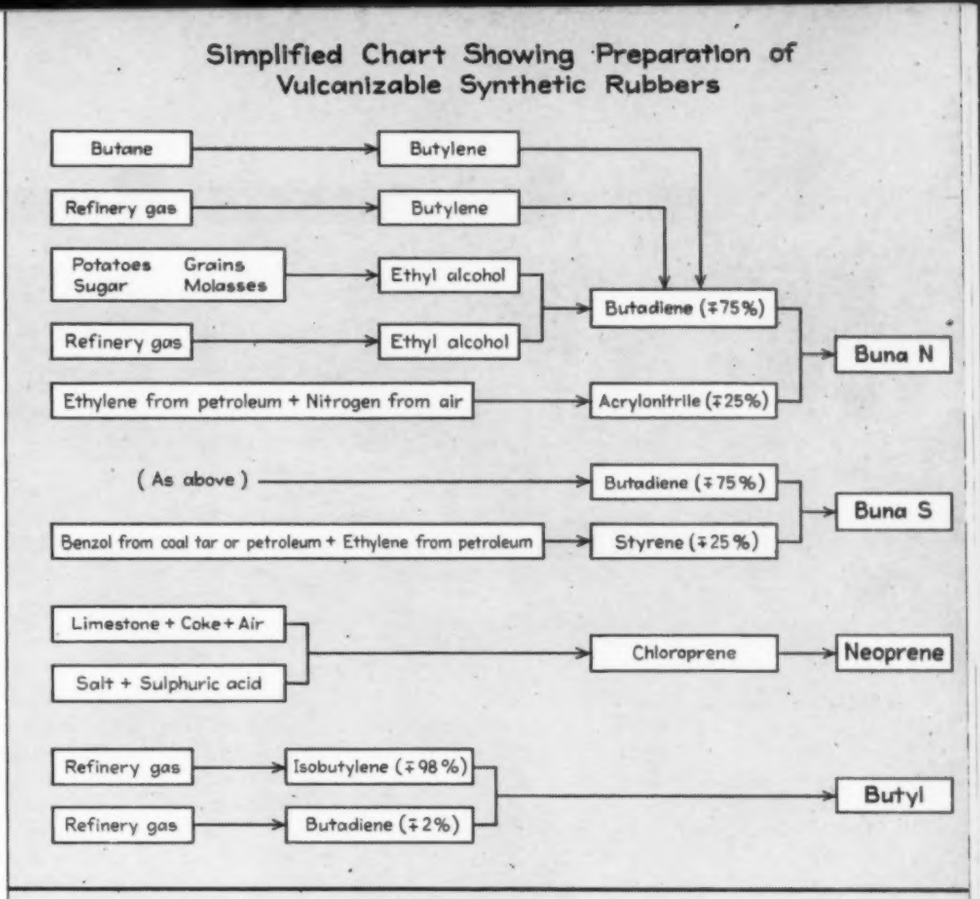
Rubber

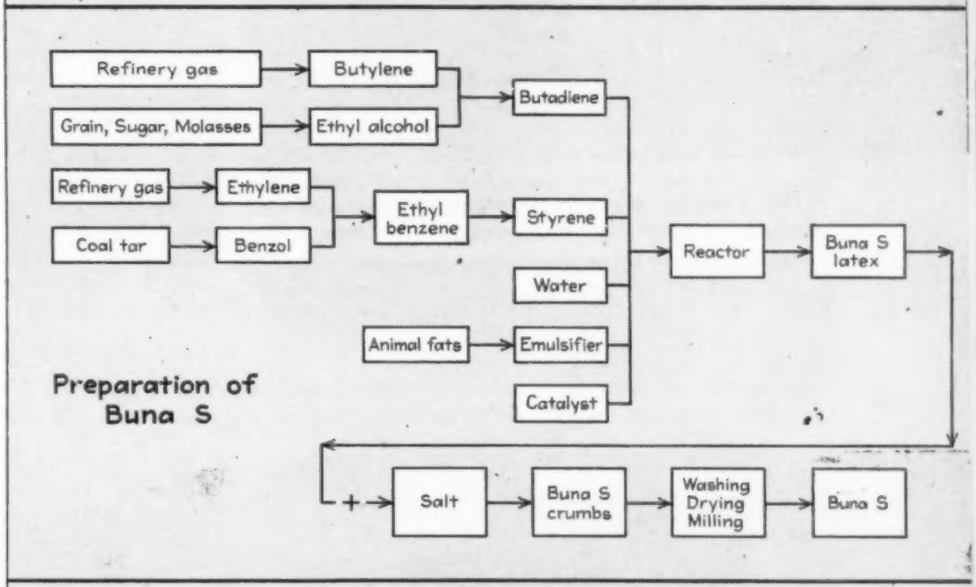
ing butadiene. By varying the catalyst and operating conditions in the "fluid-catalyst" cracking process (see *Chem. & Met.*, March 1941, p. 111), it is possible to increase the production of butylene by 2½ times without affecting the output of aviation gasoline. Or the latter can be increased by 15 percent without making more butylene, thus providing a new and desirable flexibility. The first of the fluid catalyst plants is just now getting into operation and more than thirty are under construction or in the blueprint stage.

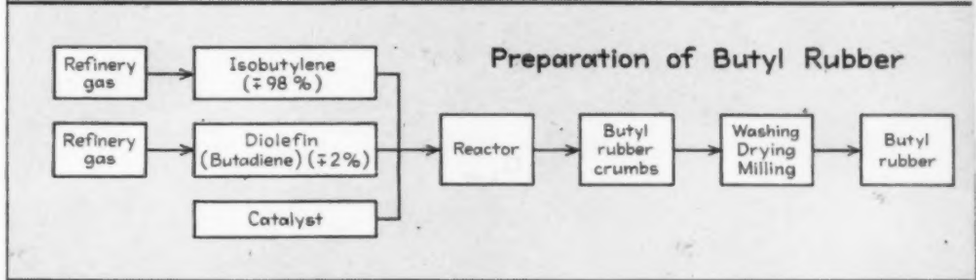
In the original W.P.B. program, all of the butadiene was to be produced from refinery gases either directly through butylene or via ethylene and ethyl alcohol. As a result of pressure in Congress from the farm state senators, headed by Senator Guy M. Gillette of Iowa, W.P.B. has now agreed to use as much as 200,000,000 gal. of grain alcohol for making butadiene. The entire liquor distilling industry is being converted to such production and most of the molasses alcohol plants will be adapted to the use of grain. In addition, the senators have made an intensive effort to have R.F.C. finance the construction of new plants in the Middlewest to produce alcohol from surplus wheat. Such new construction is now believed unlikely because it would rob other essential war industries of necessary materials of construction.

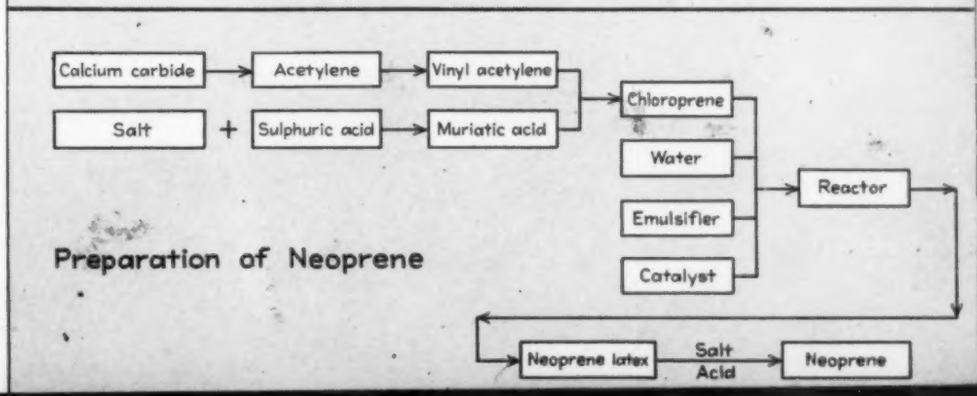
To achieve the present promise of real success on the huge W.P.B. program has required cooperation of many divisions of the chemical process industries. Individual firms and entire industries have set aside their normal desire to dominate or to control exclusively certain parts of the job. The pooling of patents has been important. But vastly more important has been the generosity of company executives and chemical engineers in sharing results of research. They have sacrificed their individual advantages, and opened up their half-completed projects of research and development, all for the common good.

It is unfortunate that the public does not know how great these sacrifices have been. Chemical engineering really needs a publicity agent to tell this story. He might undo the immense damage which political harangue and face saving of public officials has often caused.









From Arkansas' Bauxite

At last Arkansas bauxite is to be processed into aluminum at its source. Giant plants that will treat the ore are being rushed to completion. They will convert the ore into alumina and then reduce this oxide to metal, which can be flown to the strategic points in the United States to be rolled, forged, cast, or extruded into useful aluminum shapes for the war program.

The new alumina and aluminum plants were designed and are being constructed without fee or profit for the Defense Plant Corp., by engineers of the Aluminum Company of America. Both plants will be operated for the government by the company's personnel.

The largest bauxite producing area in this country is in Arkansas. It accounted for over 97 percent (437,595 tons) of the ore produced throughout the United States in 1940. Here the bauxite occurs in two separate districts, although one is far larger than the other. The mining operations, both surface and underground, are being greatly expanded.

The Republic Mining and Manufacturing Co., a wholly-owned subsidiary of the Aluminum Company of America, will only supply 35 per cent of the bauxite for the alumina plant. The majority of the ore will be furnished by Reynolds Mining Co., American Cyanamid Co., Norton Co., Dixie Bauxite Co., and any other company or individual bringing ore to the plant.

The Metal Reserve Corp., of the RFC will set up a schedule of prices which will apply to the various grades of ore.

Grade	Alumina	Silica
A	over 55%	less than 7%
B	50–55%	from 7–15%
C	45–50%	from 15–20%

One plant, located on 360 acres in the neighborhood of the mining operations, will consist of an alumina plant and a synthetic cryolite plant. This will be the largest alumina plant in the world. It will have a capacity of 1,000,000,000 lb. per year. The plant will give employment to 1,000 operators in the alumina division and 200 in the cryolite. The surface mines can serve as a great raw material storage supply as they are nearby and can be worked the entire year.

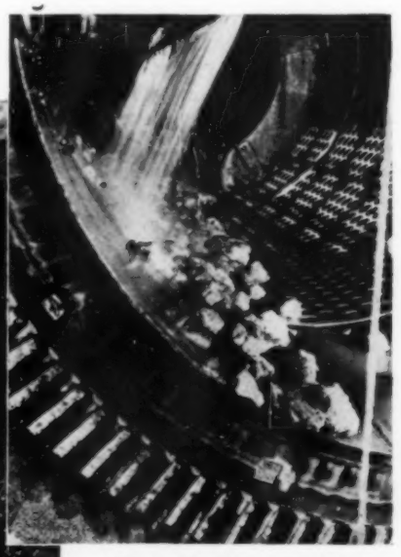
The alumina and cryolite will be shipped from that plant to the reduction plant not far away, and also to various Defense Plant Corp. metal-producing plants, where they will be used in making aluminum metal. This plant will cover 70 acres of a government-owned area of 700 acres. Over 1,000 men will be necessary to operate the plant which will have a capacity of 120,000,000 lb. per year. There will be a carbon electrode plant using Arkansas coke.

The astronomical amounts of electric energy required for the aluminum reduction works will be generated by gas-diesel-electric generators and gas-fired steam boilers driving turbines. Huge reserves of sour gas have recently been discovered in the southwest section of Arkansas. This gas contains H_2S in objectionable concentrations, but will be removed by Arkansas-Louisiana Gas Co.

The sulphur recovered from the sour gas may be employed in the production of sulphuric acid, which in turn may be used in the production of both synthetic cryolite and aluminum fluoride at the alumina plant. The sweet gas resulting from the reclamation process will be available for the generation of power at both the alumina and the aluminum plants.

The steam plant will not be completed until the summer of 1943. In the interim power equivalent to the capacity of this plant will be supplied by a pool of private utilities with a capacity of 65,000 kw. and the R.E.A. Cooperative with 35,000 kw.

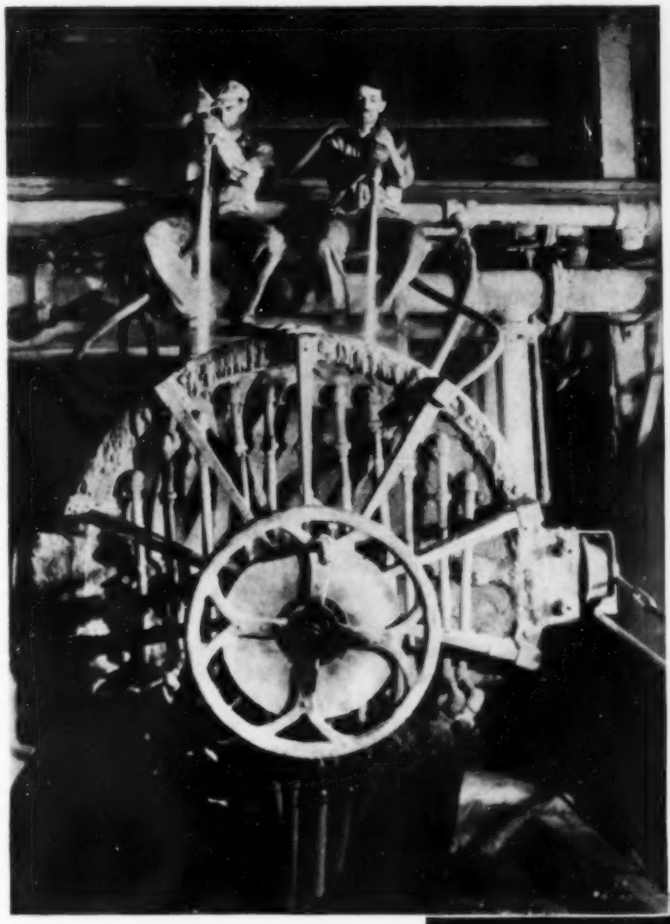
Both surface and underground mining of bauxite are practiced. Some beds are so deep that shafts and tunnels have to be dug in order to reach and remove the ore



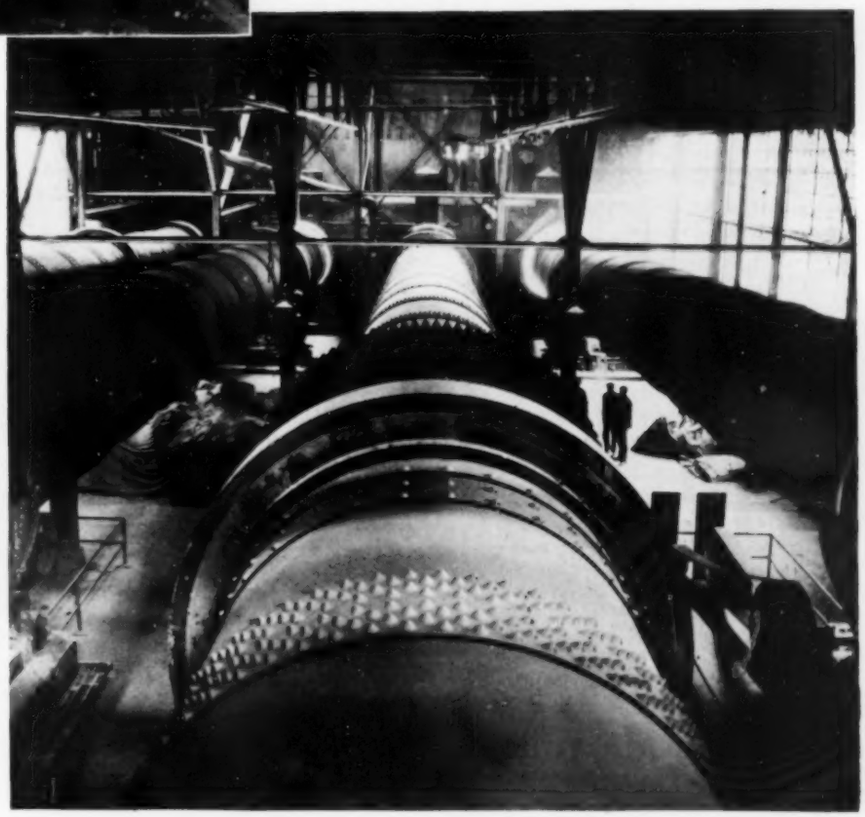
Dirt and other impurities are removed from ore by washing and screening

Some of the beds of bauxite lie close enough to the surface to be mined by the open pit method

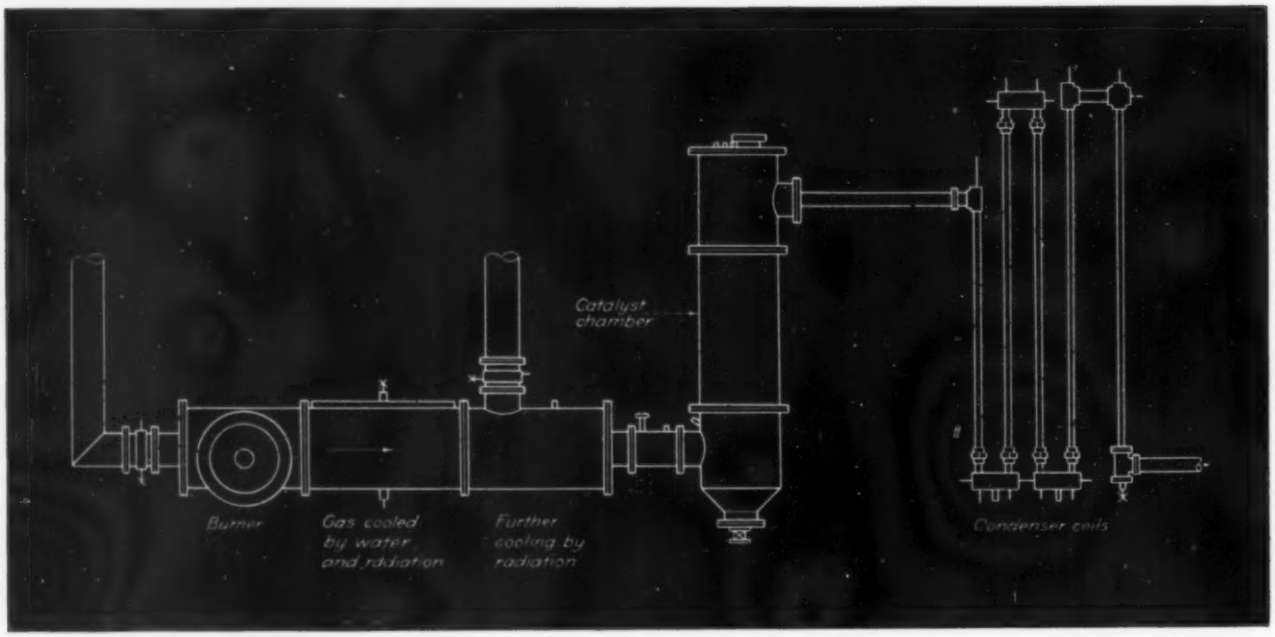
Large filter presses similar to this one will be used for removing the impurities from the ore



In large rotating kilns the aluminum trihydrate will be heated white hot to drive off chemically combined water



The alumina will be shipped to another plant nearby where it will be reduced to metallic aluminum



This pilot plant solved the problem of recovering sulphur from sour natural gas and converting the contaminating hydrogen sulphide from a nuisance to a useful commercial product

Sulphur from Arkansas Sour Gas

JAMES A. LEE *Managing Editor of Chem. & Met.*

***Chem. & Met.* INTERPRETATION**

A method has been successfully developed for the removal of sulphur from the sour gas of Southwest Arkansas which may make available for the first time in the state a source of elemental sulphur for the production of sulphuric acid and other chemicals. Based on estimates of gas reserves the total may be 1,500,000 tons.—*Editor*

SEVERAL GAS FIELDS have recently been discovered in Southwest Arkansas. They are located west of the Magnolia oil fields and south of the fields in Buckner and Louisville, and almost midway between the Rodessa development in Southwest Arkansas and Northwest Louisiana and the Smackover fields in Arkansas. The fields contain rich deposits of petroleum condensate and natural gas.

These enormous reserves of gas give the state a source of cheap fuel which Gov. Homer M. Adkins is using with much success in his campaign to attract war industries and to industrialize the state by processing Arkansas' natural resources in Arkansas. They also have another interesting feature. They contain an unusually large hydrogen sulphide content which through the efforts of the Texas Gulf Sulphur Co. has been demonstrated may be converted into a supply of elemental sulphur for the chemical industry of the state.

At present the gas acts as the lifting vehicle in the production of oil or distillate, but it is being wasted when it reaches the ground surface except for a small portion which is used as fuel in well drilling.

The distillate that is delivered at the well mouth along with gas in the Big Creek and McKamie fields is in gaseous form in the producing horizon, and as the pressure in the producing horizon is about to decline, there will be progressive condensation and absorption of the distillate in the producing horizon, the amount being dependent on the reduction in pressure with a corresponding loss in ultimate recovery. It is apparent, therefore, that reasonably uniform withdrawal of distillate and gas is imperative in these fields, and it is preferable that this withdrawal be at a rate somewhat less than the water drive to insure the satisfactory and maximum production of distillate.

These gas fields, because they form a substantial addition to the known gas resources of this section of the country, are of real interest as the source of cheap fuel. The gas, however, is a byproduct of the production of oil or distillate. To prevent the wasting of this valuable byproduct, the state of Arkansas passed an oil and gas conservation law known as Act 105 of the 52nd General Assembly under which the Arkansas Oil and Gas Commission has adopted regulations to prevent such waste and to obtain the greatest possible recovery of its natural resources and to conserve gas for its more worthwhile uses.

While petroleum condensate (60 deg. A.P.I.) can best be recovered by mechanical separators erected at the individual wells, natural gasoline and butane can be recovered through the installation of a central treating plant to serve the entire field. The presence of hydrogen sulphide in the

gas prevents the marketing of the gas and in turn prevents the production of petroleum condensate, natural gasoline and other hydrocarbons.

The hydrogen sulphide content of the gas varies from 30 to 4,500 grains per 100 cu.ft. Such gas to be useful as fuel either for the industrial purposes or for domestic uses must be purified. Gas containing 360 grains of hydrogen sulphide per 100 cu.ft. may not be objectionable when used directly as boiler fuel gas. Higher concentrations of hydrogen sulphide are objectionable because they constitute a health hazard and also may cause severe corrosion of equipment. More than 1½ grains of hydrogen sulphide per 100 cu.ft. of gas is not permitted in domestic gas because of its corrosive effect.

It was suggested that a recycling operation might be set up by means of which pressure could be maintained and the distillate removed which would convert the fields into oil fields. At a recent hearing, before the Arkansas Oil and Gas Commission, it was pointed out by operators and independent engineers that this program would be too costly as the sulphur would first have to be removed from the gas which involves reduction to 600 lb. pressure and then recompressing to 4,000 lb. for injection into the sand.

Because of the extreme "sourness" of the gas, many technical men were skeptical of the ability of any purification process to sweeten it. The Girdler Corp. dispelled all doubts on this score by installing a pilot plant in the McKamie field and demonstrated that the gas could be purified completely and economically.

The Girdler process will be used in two large purification plants, one for the McKamie Gas Cleaning Co. and the other for the Arkansas Fuel Oil Co. The former will be located in the McKamie field and the latter near Kerlin to treat gas from the Macedonia and Dorcheat fields. The combined capacity of these plants will be nearly 100,000,000 cu.ft. of gas per day, part of which will be used to provide fuel for the two aluminum plants under construction elsewhere in the state.

The McKamie Gas Cleaning Co. was incorporated under the laws of Arkansas, on Nov. 12, 1941, for the purpose of constructing a natural gas treating plant having a capacity of 25,000,000 cu.ft. of gas a day. The treating plant will remove restrictions upon the production of valuable petroleum condensate. Unless the treating plant is erected the production of condensate will be curtailed. The plant will produce natural gas for the aluminum and possibly other war plants in the state. It will also produce natural gasoline, butanes, and hydrogen sulphide.

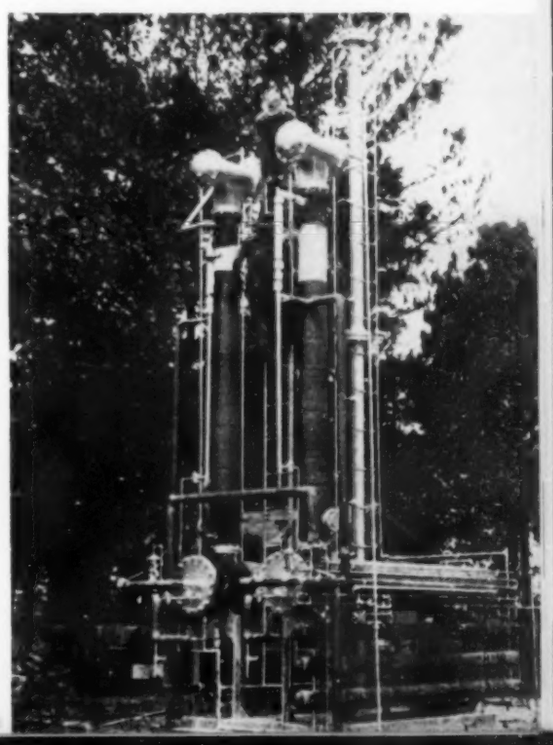
Briefly, the gas will be processed as follows: The hydrocarbons exist in the wells in a homogeneous vapor phase at pressures above 4,000 lb. per sq.in. The gas is brought to the surface and as the pressure is reduced to 800 lb. per sq.in. gage retrograde continuous condensation of heavier hydrocarbons takes place. It is then separated from the distillate at this pressure. Some operators further disengage the gas in a second separator at a lower pressure. The raw gas at separator pressure or upon recompression passes first to the Girbotol plant where it is purified by a water solution of monoethanolamine. Gas originally containing as high as 5,000 grains of H_2S per 100 cu. ft. will be treated and the H_2S content reduced to less than 0.1 grain per 100 cu. ft. so that it will meet the National Bureau of Standards lead acetate test for sweet gas. After purification it flows from the Girbotol plant to a gasoline recovery plant where natural gasoline and butanes are separated. The gas then passes through a dehydration unit which removes sufficient water vapor to prevent difficulties in transmission due to the formation and accumulation of hydrocarbon hydrates. The dehydration unit employs a solution of amines and glycols which is very effective for removing water vapor.

The effluent from the Girbotol pilot plant which contains on an average of 58 percent by volume of hydrogen sulphide, 41 percent of carbon dioxide and 1 percent of hydrocarbons (methane) on the dry basis passes to a second pilot plant erected by the Susearch Corp., subsidiary of the Texas Gulf Sulphur Co., for the conversion of hydrogen sulphide to elemental sulphur. This pilot plant was located on the Cornelius Tank Farm of the Carter Oil Co. near McKamie, Lafayette County. The design and construction of the plant are the results of experiments which had been under way for some time. In connection with the pilot plant, there was also a laboratory for control purposes. The primary function of the plant was to solve by experimentation and research the problem of recovering sulphur from sour gas and conversion of the contaminating hydrogen sulphide from a nuisance to a useful commercial product. The diagram of the plant shown on the opposite page is based on the reaction:

$$2\ H_2S + SO_2 = 2\ H_2O + 3S.$$

About 25,000 cu.ft. per day of gas are received from the Girbotol plant. One-third of this gas, after being mixed with the proper proportion of air is burned, the combustion of the hydrogen sulphide taking place in a

H_2S is removed from natural gas in this Girbotol pilot plant and sent to Susearch pilot plant for conversion into sulphur



SULPHUR IN ARKANSAS SOUR GAS FIELDS

Name	Reserves* Oil	Reserves* Gas	Daily Production Oil (bbl.)	Daily Production Gas (cu. ft.)	H_2S per 100 cu. ft. grains	Possible S. daily (in gr. tons)	Total sulphur in gas reserves (in. gr. tons)
Atlanta	6	10	2,877	4,603,000	1,800	5.26	11,480
Big Creek	3	67	241	6,025,000	335	1.28	14,310
Buckner	8	1	2,504	676,000	167	0.75	106
Dorcheat	18	144	1,988	21,027,000	2,400	32.	220,400
Magnolia	161	200	18,948	16,845,000	895	9.55	114,200
Macedonia	12	184	900	12,150,000	1,900	14.6	223,000
McKamie	37	427	3,200	22,080,000	4,500	63.4	1,225,000
Mt. Holly	5	10	400	1,600,000	374	0.38	2,385
Jones Pool	35	50	13,500	24,300,000	30	0.46	956
Reynolds Pool	3	5	2,424	2,133,000	865	1.2	2,758
Village	3	10	1,191	5,717,000	374	1.36	2,385

*Oil in millions of barrels; gas in billions of cubic feet.

specially designed burner. The products of combustion are then cooled to a selected temperature in a chamber provided with an explosion vent, and are next mixed with the remaining two-thirds of the original hydrogen sulphide gas stream and caused to enter the bottom of the catalyst chamber, which is packed with a catalyst of special composition. The gases enter the catalyst chamber at about 450 deg. F. Here the hydrogen sulphide reacts with the sulphur dioxide to form sulphur and water. The gases leaving the catalyst chamber are immediately cooled and forced through the condensing system where the sulphur is drawn off in a molten state.

As a result of this small scale operation it is proposed when constructing a commercial installation to burn about one-third of the available H_2S acid gas under a small water tube boiler with induced draft fan to supply air and give necessary pressure for operating the system. It may be necessary to install a cooler of some type at outlet of the fan to lower the temperature of the gases further than can be done in the boiler, if steam pressure is to be kept up, before being introduced into the catalyst since it is possible that after a period of operation, the temperature of mixed gases may have to be as low as 250 deg. F. in order to maintain a correct temperature in the catalyst bed. It is also possible that radiation may take care of this need—a great deal depending on the final design. It is also just as true that provision may have to be made to get some hotter gases from the boiler than would be expected of normal operation of the boiler. The burned gases would discharge from the fan through a 30 or 36-in. duct into a catalyst chamber about 15 ft. square and 10 or 12 ft. high. Secondary gas should be introduced into the duct just ahead of the catalyst chamber. Duct and chamber are to be lined and insulated. Provision is to be made for draining possible sulphur from the catalyst. A number of vertical fire tube boilers with two and one-half or three inch tubes are to be used as condensers. The first condenser boiler could be used as a cooler and the steam generated used to maintain proper temperature on the other condenser. A scheme of piping may be worked out as condensers. The tail gases can be discharged to atmosphere through a steam coil lined stack some 30 or 36 in. in diameter and 40 or 50 ft. high.

Results of the pilot plant work demonstrated that more than 80 percent of the sulphur in the hydrogen sulphide can be easily and efficiently recovered in the form of brimstone. All of the data collected, however, have not been thoroughly appraised, hence it is difficult to estimate at this time the cost of converting hydrogen sulphide to sulphur. Whether or not it will be feasible to install a large sulphur recovery plant in connection with each of the gas cleaning plants now projected can only be determined by a more careful survey of all the factors concerned in the development of the natural gas resources of Arkansas.

ECONOMICS

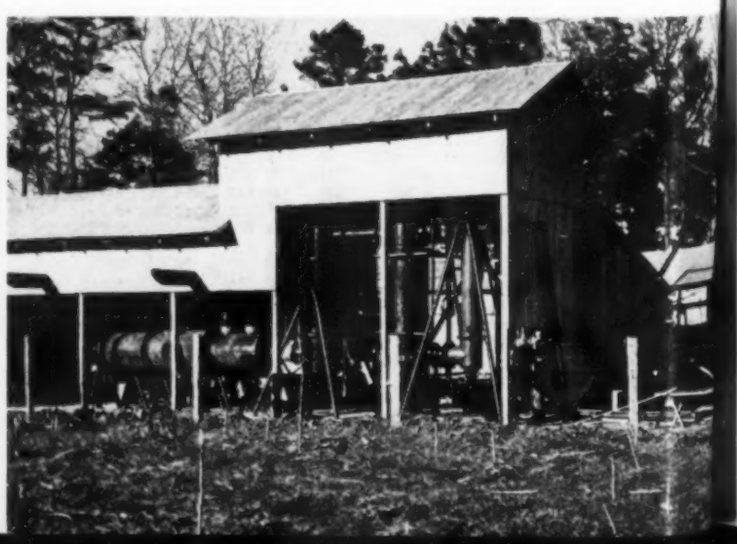
Byproduct hydrogen sulphide has been available in several localities for many years. It has been estimated that 35,000 tons of sulphur in the form of hydrogen sulphide was being removed from fuel gases; however, of this quantity only three-quarters was converted into saleable form. In the smaller plants hydrogen sulphide was burned as fuel since production was too small to justify installation of special equipment to convert it to useful form. In Germany byproduct hydrogen sulphide has been converted to elemental sulphur, but prior to the discovery of the new sour gas fields in Southwest Arkansas such conversion has always proved uneconomical in the United States.

Utilization of the hydrogen sulphide in Arkansas presents peculiar problems. Proposals to convert it to sulphuric acid find some interest because the increasing need for aviation gasoline has resulted in the installation of many new alkylation plants in which sulphuric acid is required. However, acid must be consumed within a radius of about 200 miles to be economical due to high freight rates. The alternative seems to be conversion of hydrogen sulphide to some chemical product other than sulphuric acid or the conversion to sulphur in which form it may be readily shipped greater distances.

Industry is at present engaged in appraising the gas purification situation in an attempt to find a practical and economical outlet for the byproduct hydrogen sulphide. It should be noted that because of the limited quantities of sulphide available in certain areas only that available in the McKamie, Dorcheat and Macedonia, and possibly the Magnolia fields, can be converted economically. The total hydrogen sulphide available from these fields, according to present-day estimates, may be equivalent to more than 100 net tons of sulphur daily. Based on estimates of reserves, the total available may be 1,500,000 tons with the major portion of 1,000,000 available in the McKamie field. Since it is impractical to convert this quantity of hydrogen sulphide to sulphuric acid, other uses must be found. The simplest, of course, would be the conversion of the hydrogen sulphide to elemental sulphur. Plants for such conversion, however, are expensive, therefore they probably can be economically justified only where the gas is high in hydrogen sulphide and the supply large.

Proportioning equipment for air and gas feeds to the combustion chamber of the Susearch pilot plant

Left to right—Combustion chamber, cooler, mixing chamber (H_2S and SO_2), catalyst chamber, condensers



Cooling Tower Psychrometry—III

EDWARD SIMONS

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Chem. & Met. INTERPRETATION

Concluding a series of articles on psychrometry of water cooling tower design, this installment is in three parts. The first presents equations for counter-flow forced convection towers and includes an original short-cut method of problem solution. Second part considers heat as a driving force. The third is a discussion of heat exchange and introduces the new concept of the cycle modulus.—*Editors.*

A SECTION of a typical counter-flow cooling tower is represented by Fig. 5. The rate of cooling in the differential volume dV may be expressed by the equation

$$dQ = KDadV \quad (43),$$

where K = overall coefficient of heat transfer based upon the mass velocity of the air; D = net effective driving force difference causing cooling in the section; a = active contact area per unit volume of the apparatus; V = tower volume, and Q = rate of heat exchange in the tower.

If the change in the water rate due to evaporation within the tower is neglected and if the specific heat of the water is taken at unity, the energy balance for the differential volume may be written as:

$$dQ = Gdh = L_2dT \quad (44),$$

where h is the enthalpy of the air. If D_M is the mean net driving force for the volume V, the heat rate Q, the air rate G, and the water rate L_2, and if K is constant, Eq. (43) and Eq. (44) may be combined and integrated to yield

$$L_2(T_2 - T_1) = KD_MaV \quad (45).$$

It may be shown* that the value of D at any point in the tower is $[p_T - p_w + Z(T - t_w)]$, where $Z = (sM_O/r_wM_L)\ (B - p_w)$. Fig. 6 indicates values of Z for barometric pressures from 22 in. through 30 in. Hg, with barometric intervals of 1 in.

Table IV gives a step integrated solution of a very extreme cooling problem. Fig. 7 shows a plot of the net effective driving force difference versus the water temperature. The data for Fig. 7 are contained in Table IV. If the variation in the net effective driving force difference were linear with respect to the water temperature, the logarithmic mean driving force would apply. However, the variation is not linear, and the use of the logarithmic mean would result in a driving force which would be too large; the size of the designed tower would be too small.

The value of A in Table IV (column 12) is the area exposed per pound of dry air for cooling in a given step. Thus, the summation of the step values of KA is equal to KaV/G. If the basis of the air flow is 1 lb. of air per min., Eq. (45) becomes

$$L_2(T_2 - T_1)/G = KD_M \text{ (Summation A)} \quad (46).$$

Therefore,

$$D_M = L_2(T_2 - T_1)/GK\times \text{(Summation of } A) \quad (47).$$

The heat given up in the cooling, per pound of dry air, is (0.670 × 57.0) or 38.19 B.t.u. per lb. of dry air per min. D_M is equal to 38.19 divided by the summation of KA, or,

$D_M = 38.19/102.4 = 0.373$ in. Hg.

It has been possible to compute and adjust a method whereby the logarithmic mean of the net driving force differences at the ends of the tower may be used as a basis for computation of an adjusted mean effective driving force difference, D_M. Let D_2 and D_1 be the net driving force differences at the conditions 2 and 1 respectively. Then, the logarithmic mean is

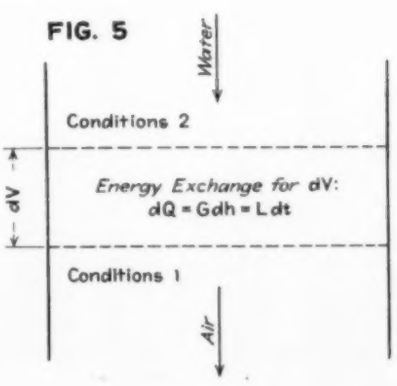
$$D_{l.m.} = D_2 - D_1/\log(D_2/D_1) \quad (48)$$

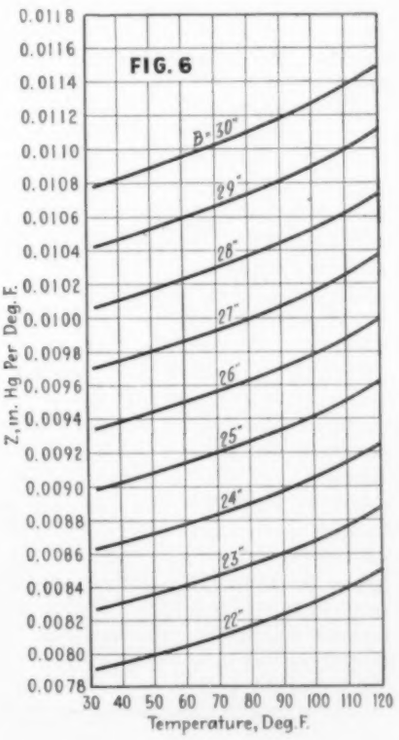
The value of the temperature T_x is located as follows:

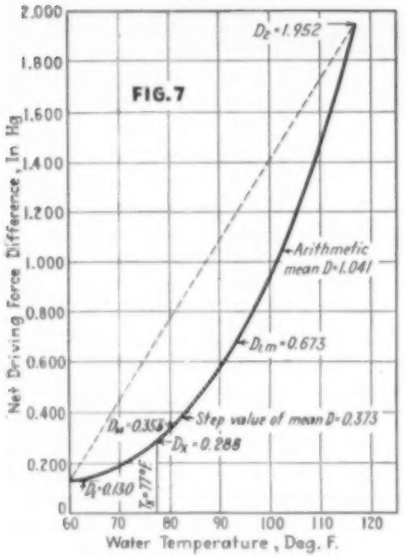
$$T_x = T_1 + (T_2 - T_1)(D_{l.m.} - D_1)/(D_2 - D_1) \quad (49).$$

When T_x has been found, the value of the net driving force difference at T_x is computed; the designation of the driving force is D_x. The value $(R = D_{l.m.}/D_x)$ is computed. The curve of Fig. 8 indicates values of λ for various values of R. When the proper value of λ has been ascer-

Fig. 5—Diagrammatic representation of a typical counter-flow cooling tower. Fig. 6—Values of Z (see table of nomenclature p. 85) for barometric pressures from 22 through 30 inches of mercury







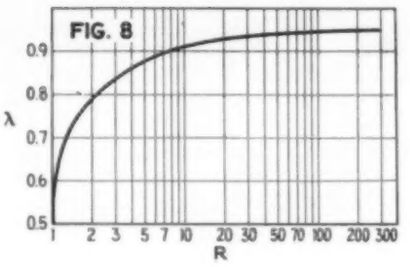


Fig. 7—Net effective driving force difference vs. water temperature: data contained in Table IV. Fig. 8—Values of λ for various values of *R*, used in solution of Eq. (50)

tained, the value of D_M is found by use of the equation

$$D_M = R\,[\lambda D_s + D_{l.m.}\,(1 - \lambda)]/(R + 0.05) \qquad (50).$$

In the case of the problem of Table IV, the following values appear in solution for the adjusted logarithmic mean driving force difference: $D_2 = 1.952$; $D_1 = 0.1296$; $D_{l.m.} = 0.6726$; $T_s = 77.0$; $D_s = 0.2880$; $R = 2.34$; $\lambda = 0.811$; $D_M = 0.353$.

The value of D_M is 0.353 in. Hg when calculated by the adjusted method; the value is 0.373 in. Hg when calculated by a step integration. The value calculated by the adjusted method is 94.6 percent of the step value; the logarithmic mean is 180 percent of the step value; and the arithmetic mean is 279 percent of the step value. The size of a tower computed from the adjusted value of D_M would be conservative.

HEAT AS A DRIVING FORCE

In the preceding discussion, the driving forces have been in terms of vapor pressure. It is possible to state the equations in terms of the enthalpy of the air.[10a, 11a] The net driving force difference is then the difference between the enthalpy of saturated air at the water temperature and the enthalpy of the air in contact with the water. Let f_e be equal to the surface coefficient for heat transfer, and let k' be the vaporization coefficient for use with a driving force based upon the difference in the values of humidity of saturated air at the bulk water temperature and the humidity in the air stream. The humid specific heat of the air stream is [7a]

$$s = 0.24 + 0.45H \qquad (51).$$

The Lewis equation [17a] holds reasonably well for the evaporation of water into air. It is stated as follows:

$$f_e = k's \qquad (52).$$

The enthalpy of the air is given by the expression[4]

$$h = 0.24\,(t - 0) + H\,(1{,}061 + 0.45t) \qquad (53).$$

The latent heat of saturated water vapor in the air at temperature T is the enthalpy of the vapor minus the heat of the liquid above 32 deg. F. It is given by the expression

$$r_T = 1{,}061 + 0.45T - T + 32 \qquad (54).$$

The differential increase in the enthalpy of the air, dh, is the increase in the sensible heat content of the original air-water mixture; plus the enthalpy of the evaporated water, dH, at the temperature of the make-up water, T; minus the sensible heat of the evaporated make-up water above the temperature of the final dry-bulb of the heated and humidified mixture. Thus,

$$dh = sdt + dH\,(r_T + T - 32) - 0.45dH\,[T - (t + dt)] \qquad (55a);$$

or,

$$Gdh = r_TGdH + Gsdt - 0.45GdH\,(T - t - dt) + GdH\,(T - 32) \qquad (55b).$$

The mass transfer is (see Fig. 5)

$$GdH = k'adV\,(H_T - H) \qquad (56).$$

The equation for heat transfer into the air is

$$Gsdt = f_eadV\,(T - t) = k'sadV\,(T - t) \qquad (57).$$

Eq. (56) is multiplied by r_T and added to Eq. (57):

$$r_TGdH + Gsdt = k'adV\,[r_T\,(H_T - H) + (0.24 + 0.45H)\,(T - t)] \qquad (58a).$$

From Eq. (55b)

$$r_TGdH + Gsdt = Gdh + 0.45\,GdH\,(T - t - dt) - GdH\,(T - 32) \qquad (58b).$$

A combination of (54), (58a), and (58b) yields

$$Gdh + 0.45\,GdH\,(T - t - dt) - GdH\,(T - 32) = k'adV\,[(h_T - h) - (H_T - H)\,(T - 32)] \qquad (58c)$$

In Eq. (58c), the effect of omitting the expressions "$0.45GdH\,(T - t - dt) - GdH\,(T - 32)$" and "$-k'adV\,(H_T - H)\,(T - 32)$" is small at the ordinary operation temperatures of cooling towers, and Eq. (58c) may be simplified to the form

$$Gdh = k'adV\,(h_T - h) \qquad (59).$$

Eq. (55b) indicates that when the reduction in water rate due to evaporation within the volume is neglected, the energy balance for the differential section of the tower volume may be written

$$LdT = Gdh \qquad (44a).$$

If a mean effective value of the driving force is established, and if integration is performed between the

Table IV—Step integrated solution of an extreme cooling problem

Wet-bulb = 55.0 deg. F.: B_s = 24.0 in. Hg: L_s/G = 0.670 lb. water per lb. air

(1) T	(2) Σ'	(3) $i_{w'}$	(4) $T - t'_w$	(5) Σ	(6) (4)×(5)	(7) p_T	(8) p_0	(9) (7)−(8)	(10) D=(6)+(9)	(11) ΔQ	(12) $KA = \Delta Q/D$
117	63.63	90.7	26.3	0.00898	0.2362	3.169	1.453	1.716	1.952	1.01	0.52
114	61.62	89.4	24.6	0.00896	0.2204	2.911	1.395	1.516	1.736	2.01	1.16
111	59.61	88.1	22.9	0.00895	0.2050	2.672	1.339	1.333	1.538	2.01	1.31
108	57.60	86.8	21.2	0.00894	0.1895	2.449	1.285	1.164	1.354	2.01	1.49
105	55.59	85.4	19.6	0.00893	0.1750	2.243	1.229	1.014	1.189	2.01	1.69
102	53.58	83.9	18.1	0.00892	0.1615	2.052	1.171	0.881	1.043	2.01	1.93
99	51.57	82.4	16.6	0.00891	0.1479	1.875	1.116	0.759	0.9069	2.01	2.22
96	49.56	80.8	15.2	0.00890	0.1353	1.712	1.060	0.652	0.7873	2.01	2.56
93	47.55	79.2	13.8	0.00889	0.1227	1.561	1.006	0.555	0.6777	2.01	2.97
90	45.54	77.5	12.5	0.00888	0.1110	1.422	0.9509	0.471	0.5820	1.68	2.89
88	44.20	76.3	11.7	0.00887	0.1038	1.335	0.9138	0.421	0.5248	1.34	2.55
86	42.86	75.1	10.9	0.00886	0.0966	1.253	0.8780	0.375	0.4716	1.34	2.85
84	41.52	73.8	10.2	0.00885	0.0903	1.175	0.8406	0.334	0.4243	1.34	3.16
82	40.18	72.5	9.5	0.00884	0.0840	1.102	0.8048	0.297	0.3810	1.34	3.52
80	38.84	71.2	8.8	0.00884	0.0778	1.032	0.7701	0.262	0.3398	1.34	3.95
78	37.50	69.8	8.2	0.00883	0.0724	0.9666	0.7342	0.232	0.3044	1.34	4.41
76	36.16	68.4	7.6	0.00882	0.0670	0.9046	0.6999	0.205	0.2720	1.34	4.93
74	34.82	66.9	7.1	0.00881	0.0625	0.8462	0.6646	0.182	0.2445	1.34	5.49
72	33.48	65.4	6.6	0.00880	0.0581	0.7912	0.6310	0.160	0.2181	1.34	6.15
70	32.14	63.8	6.2	0.00879	0.0545	0.7392	0.5968	0.142	0.1965	1.01	5.14
69	31.47	63.0	6.0	0.00879	0.0527	0.7144	0.5802	0.134	0.1867	0.670	3.59
68	30.80	62.2	5.8	0.00878	0.0509	0.6903	0.5641	0.126	0.1769	0.670	3.79
67	30.13	61.4	5.6	0.00878	0.0492	0.6669	0.5485	0.118	0.1672	0.670	4.01
66	29.46	60.5	5.5	0.00877	0.0482	0.6442	0.5313	0.113	0.1612	0.670	4.16
65	28.79	59.6	5.4	0.00877	0.0474	0.6222	0.5145	0.108	0.1554	0.670	4.31
64	28.12	58.7	5.3	0.00876	0.0464	0.6009	0.4982	0.103	0.1494	0.670	4.48
63	27.45	57.8	5.2	0.00876	0.0456	0.5802	0.4824	0.0978	0.1434	0.670	4.67
62	26.78	56.9	5.1	0.00875	0.0446	0.5601	0.4669	0.0932	0.1378	0.670	4.87
61	26.11	56.0	5.0	0.00875	0.0438	0.5407	0.4520	0.0887	0.1325	0.670	5.06
60	25.44	55.0	5.0	0.00874	0.0437	0.5218	0.4359	0.0859	0.1296	0.335	2.58

Summation of KA = 102.41

NOMENCLATURE

a = Area of active cooling surface per unit of tower volume, sq. ft. per cu. ft.
a_f = Area of packing exposed to water flow, per unit of tower volume, sq. ft. per cu. ft.
A = Area of cooling exposed in an integration step, sq. ft. per lb. dry air.
b_a = A function of the cycle modulus, Fig. 10.
b_f = A function of the cycle modulus, Fig. 11.
B = Barometric pressure, in. Hg.
B_s = Barometric pressure used in calculations involving comparison with basic data at 30.0 in. barometer, in. Hg.
c = Height of a packing cycle, ft. per cycle.
D = Net driving force difference, or effective potential, in. Hg.
D_f = Diffusivity, sq. ft. per min.
$D_{l.m.}$ = Logarithmic mean net driving force difference, in. Hg.
D_M = Mean net driving force difference, in. Hg.
D_s = Net driving force difference at water temperature T_s, in. Hg.
f_s = Overall coefficient of heat exchange by conduction and convection, B.t.u. per sq. ft., deg. F. temp. diff., and min.
G = Rate of air flow through tower, lb. bone dry air per min.
h = Enthalpy of the air-water mixture, B.t.u. per lb. dry air.
h_T = Enthalpy of saturated air-water mixture at the temperature of the bulk of the liquid, B.t.u. per lb. dry air.
H = Air humidity, lb. of water vapor per lb. bone dry air.
H_T = Humidity of saturated air at temperature T, lb. per lb.
I = Cycle Modulus, g.p.m. per sq. ft. per cycle.
k = Vaporization coefficient, or conductance for vapor transfer, lb. water vapor per sq. ft. min., and in. Hg diff.
k' = Vaporization coefficient, or conductance for vapor transfer, lb. water vapor per sq. ft., min., and lb. per lb.
k_g = Vaporization coefficient, lb. moles per min., sq. ft., and atm.
K = Overall coefficient of heat exchange based upon the mass velocity of the air, B.t.u. per sq. ft., min., and in. Hg diff.
L = Water rate through cooling tower, lb. per min.
m = Exponent used in calculation of K in Eq. (77), a function of I.
M_a = Molecular weight of dry air.
M_L = Molecular weight of water.
n = Exponent used in calculation of K in Eq. (78), a function of I.
N_L = The rate of diffusion of water vapor, moles per unit area and unit time.
NTU = Number of transfer units.
p_{AM} = Log mean partial pressure of inert gas, air, atmospheres.
p_a = Partial pressure of water vapor in the main air stream, atm.
p_i = Partial pressure water vapor at the interface, considered the pressure of water vapor in saturated air at T, atm.
p_w = Saturated pressure of water vapor at the wet-bulb temperature, in. Hg.
P_a = Total absolute pressure, atm.
P_g = Pressure of a gas, in. Hg.
q = One tenth of the apparent free convection value for K at $B = 30$ in.
Q = Rate of exchange in a cooling tower, B.t.u. per min.
r = Latent heat of vaporization of water vapor, B.t.u. per lb.
R = $D_{l.m.}/D_s$.
R_a = The gas law constant.
s = Humid specific heat air-water mixture, B.t.u. per deg. F., and lb. of dry air.
S = Gross cross sectional area of cooling tower at right angles to the air flow, all packing removed, sq. ft.
t = Temperature of the air-water mixture, or dry-bulb temperature, deg. F.
t_w = Wet-bulb temperature, deg. F.
T = Bulk temperature of the water, deg. F.
T_A = Absolute temperature, deg. Rankine or Kelvin.
T_s = Temperature of water at which D_s occurs, deg. F.
U_s = Average linear velocity of air stream over packing surface, ft. per min.
V_H = Humid volume of air entering tower.
V_a = Molecular volume of air. [17]
V_L = Molecular volume of water vapor. [17]
x = Effective total film thickness, unit length.
Z = General value of f_s/kr, in. Hg per deg. F.
α = A factor to compensate for unwetted packing, equal to $0.30 + 1.90I$.
λ = A function of R used in Eq. (50) for determination of D_M.
Σ = The Sigma Function, in main air stream, B.t.u. per lb. dry air.
$\cong$ = Denotes sensible equivalence.

SUBSCRIPTS

M = A mean effective value.
T = Conditions at water temperature, T.
1 = Conditions at the air entrance and water exit of a counter-flow tower.
2 = Conditions at the water entrance and air exit of a counter-flow tower.

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proper limits associated with the tower volume, resultant equation is

$$G(h_2 - h_1) = k'aV(h_T - h)_M \quad (60a),$$

where $(h_T - h)_M$ is the mean effective driving force potential.

Eq. (60a) may be re-arranged as follows:

$$(h_2 - h_1)/(h_T - h)_M = k'aV/G = NTU \quad (60b),$$

where NTU is the number of transfer units. The height of the packing divided by the NTU gives the height of a transfer unit. The transfer unit corresponds to a change in enthalpy equal to the mean driving force difference. The NTU is a measure of the difficulty of the cooling operation. The use of the enthalpy driving force and the NTU concept offers an approach to a design method similar to the method used in the design of extraction towers.

In Eq. (58c), the quantity "$h_T - H_T(T - 32)$" is the sigma function for saturated air at the temperature T. The quantity "$h - H(T - 32)$" is the sigma function of the air stream less the heat of liquid above the wet-bulb; practically, it is the sigma function of the air stream. The heat added to the air stream per pound of dry air is, from Eq. (27),

$$\Sigma_2 - \Sigma_1 \cong L_2(T_2 - T_1)/G \quad (27a).$$

Therefore, it is possible to set up a practical design equation in terms of the sigma function of saturated air at the temperature of the bulk of the liquid and the sigma function of the main air stream. The equation is stated as follows:

$$G(\Sigma_2 - \Sigma_1) = L_2(T_2 - T_1) = k'aV(\Sigma_T - \Sigma)_M \quad (60c).$$

THE COEFFICIENT OF HEAT EXCHANGE

The coefficient of heat exchange is in terms of B.t.u. per min. per sq. ft. of contact area per in. Hg of driving force difference. It is the product of the mass transfer coefficient, or conductance, and the latent heat of the vapor. Coffey and Horne[13] made tests to determine the value of this coefficient; they proposed a straight line formula for definition of K. In 1918, Carrier[14] presented straight line formulas for K which were for the cases of transverse and parallel flow; a re-plotting of the Coffey and Horne data indicated a close agreement with the resultant plot of Carrier's points for transverse flow. The straight line formulas showed the values of K to be dependent upon the linear velocity of the air stream passing over the wetted surface. At zero linear velocity, the value of K was not zero; the effect of free convection was indicated. These experiments were performed upon evaporators with wick-covered surfaces.[15]

In a cooling tower, the surfaces of the packing are covered with moving water films, and the evaporative action differs from the action which occurs from a wick-covered surface; the surface of a wick, due to its texture, differs from the surface of a water film. As the water passes

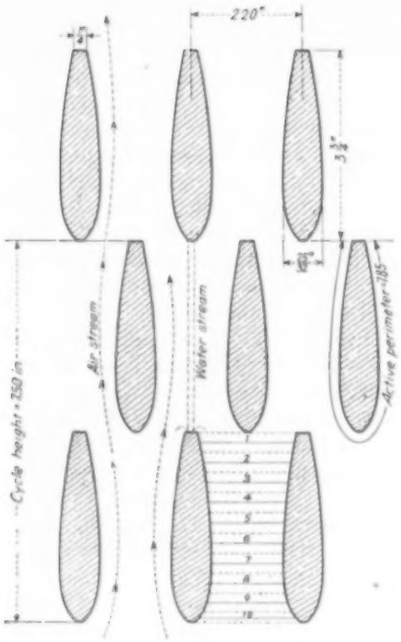


Fig. 9—Ovate packing of the Redwood Manufacturers Co. Clearances at the various sections of the slots are: (1) 1.88 in.; (2) 1.75 in.; (3) 1.63 in.; (4) 1.53 in.; (5) 1.48 in.; (6) 1.44 in.; (7) 1.43 in.; (8) 1.44 in.; (9) 1.60 in.; (10) 1.97 in. Average clearance is 1.62 in. Ratio of U_s to gross velocity over S is 1.36

over the guiding surfaces of the packing, the films are affected by the waves and by the stirring action. Furthermore, the stirring action in the water sheets has an effect upon the rate at which the heat reaches the inter-face of the transfer surface. According to the basic concept of Maxwell,[17d] there is a resistance to diffusion proportional to the number of molecules of the diffusing gas; proportional to the number of molecules of the gas through which diffusion takes place; proportional to the difference between the velocity of the diffusing gas in the direction of net diffusion and the velocity of the second gas; and proportional to the length of the path in the direction of net diffusion.

The following equation[17e] indicates the evaporative rate for true diffusion:

$$N_L = D_f P_s (p_i - p_G)/R_s T_A x p_{AM} \quad (61),$$

where N_L = rate of diffusion for water vapor, mols per unit area and unit time; D_f = diffusion coefficient, or diffusivity, (unit length)^2 per unit time; p_s = total atmospheric pressure, atmospheres; R_s = gas-law constant; T_A = temperature, deg.K. or deg. R.; x = effective total film thickness, unit length; p_{AM} = log mean partial pressure of the inert gas, air, atmospheres; p_i = vapor pressure of water at the inter-face, atmospheres; p_G = partial pressure of water vapor in the main air stream, atmospheres.

The diffusion indicated by Eq. (61) is for the case of truly stagnant fluid layers. However, even in the turbulent layers, the rate of eddy diffusion may be assumed to be proportional to the partial-pressure gradient, as in true diffusion. And Eq. (61) may be applied with success to the inter-phase diffusion, involving transfer across both the eddy layer and the laminar layer.

The diffusion may be found from the equation[17f]

$$D_f = 0.0043\ T_A^{1.5}\ (1/M_G - 1/M_L)^{0.5}/P_s\ (V_L^{1/3} + V_G^{1/3})^2 \quad (62),$$

where T_A = temperature in deg. K.; M_L = molecular weight of water vapor; M_G = molecular weight of dry air; V_L, V_G = molecular volumes. Eq. (62) gives the value of D_f in sq. cm. per sec.

Let k_G be defined by the following equation:

$$k_G = N_L/(p_i - p_G) \quad (63).$$

Then, Eq. (63) combines with Eq. (61) to yield

$$k_G = D_f P_s/R_s T_A x p_{AM} \quad (64).$$

Since D_f varies inversely with P_s and since x does not vary with the pressure, it follows that k_G varies inversely as the partial pressure, p_{AM}, of the inert gas, air.

Let k' represent the vaporization coefficient in the simplified diffusion equation

$$N_L M_L = k' (H_T - H) \quad (65)$$

where H_T = humidity of saturated air at the temperature of the bulk of the liquid, considered the humidity at the interface, and H = humidity of the main air stream. By the use of the gas laws (see Eq. (5) for air humidity),

$$H_T - H = [p_i/(P_s - p_i) - p_G/(P_s - p_G)]/(M_L/M_G) \quad (66).$$

Since, in most cases, p_i and p_G are small compared to P_s and since $P_s - p_i$ is approximately equal to both $P_s - p_G$ and p_{AM}, Eq. (66) may be re-written

$$H_T - H = M_L (p_i - p_G)/M_G p_{AM} \quad (67).$$

From Eq. (65),

$$k' = N_L M_L/(H_T - H) \quad (68).$$

But, from Eq. (63),

$$N_L = k_G (p_i - p_G) \quad (69).$$

Therefore, by substitution of (69) and (67) in Eq. (68),

$$k' = k_G M_G p_{AM} \quad (70).$$

Inspection of Eq. (70) indicates that k' varies as the product $k_G p_{AM}$. However, since k_G varies inversely as p_{AM}, the product $k_G p_{AM}$ does not vary with variation in the partial pressure of the inert gas, air.

Let k represent the vaporization coefficient in the simplified diffusion equation in which the vapor pressures are in inches of mercury:

$$N_L M_L = k (p_T - p_a) \quad (71).$$

Then, Eq. (65) may be combined with Eq. (71) to yield

$$k (p_T - p_a) = k' (H_T - H) \quad (72).$$

Let B equal the barometric pressure in inches of mercury. Then, in form similar to Eq. (66),

$$k (p_T - p_a) = k' [p_T/(B - p_T) - p_a/(B - p_a)] (M_L/M_G) \quad (73).$$

If $B - p_T$ is assumed equal to $B - p_a$,

$$k = k' M_L/(B - p_a) M_G \quad (74).$$

Since $B - p_a$ approximates the value of the barometric pressure, k varies approximately inversely as the barometric pressure, since k', M_L, and M_G are independent of pressure variations of the inert gas.

The value of k multiplied by the latent heat of evaporation is equal to K, the coefficient of heat exchange for cooling tower action when the driving forces are in terms of inches of mercury pressure.

Nusselt[18a] has shown experimentally that, in heating air in the range from 1.1 to 16 atm., the mass velocity of the air is the controlling factor in the determination of the coefficient of heat transfer by convection. The control by the mass velocity is independent of pressure changes. The Lewis equation indicates that k' varies directly as f_c, and indirectly as the humid heat, s. Therefore, k' varies with the mass velocity of the air; and k must also vary with the mass velocity of the air. Colburn and Hougen[16b] found that the vapor diffusion coefficient varied as the mass velocity to a fractional power. Sherwood[17b] cites experimental support for the mass velocity control.

The exponents of the mass velocity which are used in the determination of coefficients for convection indicate the approximate values of the exponents of the mass velocity to be used in the determination of K. The unit mass transfer conductance[18] varies with the 0.37 power of the air velocity for normal flow of the air, with the 0.56 power for transverse flow, and with the 0.80 power for longitudinal flow. The data on transverse flow over pipe coils[11b] indicate valuations of the exponent which vary from 0.45 to 0.65. London, Mason and Boelter[10b] stated a value of 0.48 for streamlined packing. Niederman, Howe, Longwell, Seban, and Boelter found that the exponent was 0.5 for the wetted wall of a spray tower.[20]

Comparative investigations indicate that there may be variations in K due to changes in the water rate. The writer has found that these variations may be considered in design by the use of the cycle modulus, I. The cycle modulus is defined by the equation

$$I = 0.120\, L_2/Sa_t c \qquad (75),$$

where I = the cycle modulus, gal. per min. per sq. ft. per cycle; L_2 = initial liquid rate, lb. per min.; S = gross cross sectional area of the tower at right angles to the air flow (the open area with packing removed), sq. ft.; a_t = the area of packing surface per unit volume of tower, ft. per cu. ft.; c = the cycle height, ft. per cycle. If, in a symmetrically packed tower, the water passes through a first section at right angles to the direction of flow and continues through the tower until it passes a second parallel section which cuts the packing so that the sectional elements of the cut packing are in perfect alignment with similar elements cut by the first section, the water has passed through the height of one cycle.

The streamlined Ovate[9] packing of the Redwood Manufacturers Co. (U.S. Patent 2,207,272) is shown in Fig. 9. The air flows over the surface with transverse flow. The cycle height of this packing is 7.50 in., or 0.625 ft. The effective perimeter is 7.85 in.; only this perimeter is considered active. The narrow, flat width at the trailing end is considered inactive for cooling design, since this trailing end is blanketed. However, the total perimeter is considered in the computation of the cycle modulus. Thus, the value of a is 11.42 sq. ft. per cu. ft. and the value of a_t is 11.78 sq. ft. per cu. ft. When the value of I is less than 0.370 gal. per min. per sq. ft. of cycle surface, K should be multiplied by a factor, α (alpha), to compensate for unwetted surface:

$$\alpha = 0.30 + 1.90I \qquad (76).$$

Fig. 10 is used for ovate packing when the linear velocity exceeds 300 ft. per min. The formula for K is as follows:

$$K = b_f\,(12.8\,U_s/V_H)^m(30)/B_s \qquad (77),$$

where U_s = the average linear velocity of the air over the cooling surface, ft. per min.; V_H = humid volume of air entering the tower; m = an exponent, a function of the cycle modulus; b_f = a coefficient, a function of the cycle modulus.

Fig. 11 is for the computation of K for ovate packing when the linear velocity of the air is less than 300 ft. per min. The values of K resulting from the use of Fig. 11 are influenced by an apparent free convection effect, which is represented upon the chart by the curve for q. Ten times the value of q is the apparent free convection value.

The formula for K is as follows:

$$K = [10q - b_c\,(12.8\,U_s/V_H)^n/10]\,(30/B_s) \qquad (78),$$

where q = a function of the cycle modulus, one tenth of the apparent free convection value of K; n = an exponent, a function of the cycle modulus; b_c = a coefficient, a function of the cycle modulus.

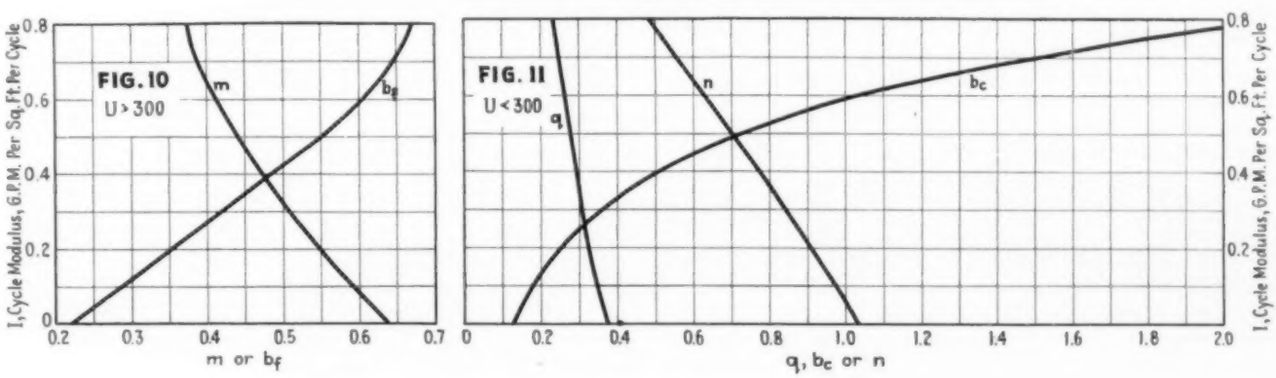
The exponent m of Fig. 10 for forced convection is 0.63 for a cycle modulus of zero. This value is in agreement with the value of the exponent used for drying calculations.[31c] For a cycle modulus of zero, the values of $10q$ and n from Fig. 11 show agreement with the results of Carrier. The data of Figs. 10 and 11 are for the Ovate packing with streamlined shape. Data for the packings of absorption equipment have been given in which 0.8 is the value of the exponent.[10a,17b] The values from Fig. 10 indicate values of the exponent which approximate 0.5; this exponent is in accordance with recent work on packed towers.[20] The values of K for ovate filling may be used for transverse flow conditions with rectangular packing sections and cycle heights up to 16 in.

The reciprocal of k' for ovate filling plotted against the reciprocal of the mass velocity of the air to the exponent $m = 0.5$ gives a line which is practically straight and which passes through the origin.[17b] The indications are that the liquid film resistance is negligible and that the gas film is controlling. Dwyer and Dodge[20] indicate that the diffusion coefficients should be nearly independent of temperature.

Since the values of the exponent m for convection and diffusion show agreement with the values of the exponent for ovate filling, it is suggested that designs involving transverse flow may be made using the data for ovate packing with the cycle moduli determined from Eq. (75). The effect of the water drops is slight, and the neglect of the drop-surface effect introduces a conservative element into the design. When packings have blanketed surfaces,[12] the value of $10q$ for the cycle modulus in question may be used for the portion of the surface which is exposed to the reduced air flow. The actual blanketed surface area may be considered as a reduced area acting with the full conductance of the fully efficient surfaces.

In a spray tower, at constant barometer, the conductance of the area exposed by the spray does not vary with the air rate;[19] the principle variation in K is due to change in the liquid rate. Therefore, in comparing the actions of a spray tower at various air rates, the spray conductance varies as the zero power of the mass velocity of the air. Thus, a change in the air rate in a spray tower affects the driving force, but the constancy of the conductance tends to stabilize the tower action.

Fig. 10—Values for use in Eq. (77) for computation of K when linear velocity exceeds 300 ft. per min. Fig. 11—For use in Eq. (78), these values are used when linear velocity of air is less than 300 ft. per min.



When water is sprayed into air, some of the very fine drops are completely vaporized,[10a,19] and therefore contribute nothing to the cooling of the circulated liquid from which they are sprayed. The relationship of the Lewis modulus does not often hold in spray installations; the heat content of the air is increased and the cooling potentials are reduced. Furthermore, the liquid within the drops is not subjected to mechanical stirring; heat must pass from the heart of the drop to the film by means of convection and conduction. The coefficients of mass transfer and heat transfer appear to decrease as the temperatures of the liquid and the gas are increased.

In some of the literature,[11a,19] the logarithmic mean driving force difference is used in the computation of the coefficient of mass transfer. At the higher inlet water temperatures, the log mean driving force potential is too great, and the calculated coefficient is less than the coefficient which would be calculated from a true mean value. Therefore, when the log mean potential is used without adjustment to the true mean, the coefficient that corresponds to the method of computation should be used.

From Eq. (74) it may be shown that

$$k' = 1.61k\,(B - p_w) \qquad (79).$$

K is the product of k and the latent heat. If the average value of the latent heat is taken at 1,050 B.t.u. per lb.,

$$k' = K\,(B - p_w)/652 \qquad (80a);$$

or, since $(B - p_w)$ approximates B,

$$k' = KB/652 \qquad (80b).$$

The step solution of Table IV is for a barometric pressure of 24.0 in. Thus, for the problem of Table IV, the following solution by means of the sigma function driving force difference shows the agreement of the method with the vapor pressure driving force method.

From Eq. (80b), with a value of B equal to 24.0 in., k' equals $0.0368K$. Then,

$$KD_M = 0.0368K\,(\Sigma_T - \Sigma)_M \qquad (81a).$$

and,

$$D_M = 0.0368\,(\Sigma_T - \Sigma)_M \qquad (81b).$$

The driving forces are: $(\Sigma_T - \Sigma)_2 = 61.97$; $(\Sigma_T - \Sigma)_1 = 3.62$; $(\Sigma_T - \Sigma)_{l.m.} = 20.57$; $T_s = 76.6$; $(\Sigma_T - \Sigma)_s = 7.99$; $R = 2.57$; $\lambda = 0.822$; $(\Sigma_T - \Sigma)_M = 10.00$. The value of D_M from Eq. (81b) is therefore 0.368 in. Hg. This value is in excellent agreement with the value of 0.373 in. Hg which was computed by the step integration process.

Since k' is practically independent of variation in the barometric pressure, and since the sigma function driving force is a reliable approximation for design, Eq. (60c) is indicated as an efficient means of calculation for use in design calculations and calculations for the comparison of operation under various conditions.

CONCLUSIONS

1. The adjusted logarithmic mean driving force difference may be used to compute the mean effective driving potential. The method gives reasonable accuracy of solution, and the long and tedious process of step integration is replaced by a short-cut method.

2. The relationship expressed by the Lewis equation makes possible the establishment of a driving force system which is in terms of enthalpy differences. The adjusted logarithmic mean driving force method applies to the solution by enthalpies.

3. K is inversely proportional to the log mean pressure of the inert gas, air; it is approximately inversely proportional to the barometric pressure.

4. k' is practically independent of the partial pressure of the inert gas, and is, therefore, practically independent of variations in the barometric pressure.

5. The cycle modulus is used as a basis for the determination of K at various liquid rates; a decreased cycle modulus is indicative of thinner water sheets.

6. K and k' vary approximately as the 0.5 power of the mass velocity of the air for transverse flow of the air over the packing.

7. K (for packed surface) is nearly independent of temperature. For spray surface, the conductance appears to decrease with increase in temperature.

8. The driving force based upon the sigma function difference is indicated as a reliable factor for practical design. For practical calculations, k' is independent of variation in the barometric pressure; k' varies with the mass velocity of the air. When the sigma function basis is used, the transfer unit corresponds to a change in the sigma function of the main air stream equal to the mean effective driving force potential expressed as a sigma function difference.

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REVIEW AND SUMMARY

After an introductory review of psychrometric principles, the first of this series of three articles discussed the straight-line formula of Goodman for enthalpy and latent heat, and the energy equation for cooling tower operation in terms of the sigma function of Carrier. In the part which appeared in the May issue of *Chem. & Met.*, the author presented what is believed to be a new and hitherto unpublished graphical method for use in determining outgoing air conditions with varying temperature of make-up water. Method of drawing this "psychrometric polygon" on the familiar humidity chart was given. Also in this part was the derivation of equations with methods of use whereby a humidity chart for 30-in. barometer conditions could be used at any barometric pressure.

In the present paper are differential and integrated equations for counterflow forced convection cooling towers. A step-integration of an extreme case (Table IV) is compared with the author's original short-cut method of using an adjusted logarithmic mean driving force for the solution of such problems. Also considered is heat as a driving force. (In the author's previous series vapor pressure was used as the driving force; temperature was converted to vapor pressure.) Consideration of the driving forces in terms of the sigma function indicate that it is superior to the enthalpy driving force.

Under the general heading of "coefficient of heat exchange" are the fundamental equations of diffusion and diffusivity, coefficients for use with vapor pressure difference and with concentration (humidity) difference. Effects of variations in barometric pressure and mass velocity of air in packed towers are considered. Also in this section is the description of the cycle modulus—an original concept the use of which enables the designer to adjust the diffusion coefficient for practically any liquid concentration over the surface of the packing. The extreme problem previously presented is solved using the sigma function driving force and adjusted values of the diffusion coefficient. Curves for use with the cycle modulus are included. Value of the diffusion coefficient for staggered rectangular packings or for ovate packings may be determined. —*Editors.*

CHEM & MET REPORT ON

Southwestern Chemical Resources and Trends

TO EXECUTIVES AND ENGINEERS OF CHEMICAL ENTERPRISES

With every effort being made to locate new sources of raw materials and sites for new war-time production, the accompanying presentations of the natural resources of each of the states of the Southwest, Arkansas, Louisiana, Oklahoma and Texas, by leading authorities, should be of timely interest. This region west of the Mississippi River and north of the Gulf of Mexico is the richest in natural resources of any in the entire country. Due to this attraction, to the fact that the area is still comparatively undeveloped industrially, and because it is generally recognized that production costs are lower than in the East and Middle West, most of the leading chemical companies have already moved in, while others are known to be considering decentralization in connection with their post-war planning. In addition to these discussions of resources the report also includes a survey of trends in the industrialization of the Southwest.

CHEMICAL AND METALLURGICAL ENGINEERING · JUNE, 1942

Southwestern Chemical Resources and Trends

SUMMARY AND CONCLUSION

Every few years *Chem. & Met.* has reported to its readers the trends in the industrial development of the South. These reports generally emphasized the states east of the Mississippi River. However, the wealth of mineral resources west of the river, and the tremendous strides in development of that area recently have made it necessary to devote an entire report to the Southwest.

Some of the conclusions that stand out are as follows:

This section has the greatest wealth of natural resources of any in the United States. With the discovery of oil came industry, and with the finding of natural gas and development of other resources came an acceleration of the movement. And since the resources had greatest appeal to the process industries, most of the activity has been by this group.

The war program is advancing industrialization of the Southwest at a tremendous rate, bringing chemical organizations to the area who otherwise would not have come for many years.

Many of the plants are making products for which there has long been a need. And producers of aluminum, magnesium, synthetic rubber and organic chemicals are finding it more economical to manufacture at the source of raw materials. Therefore, the post-war retrenchments are not likely to be as serious in the Southwest as in other sections of the country.

THE SOUTHWESTERN STATES (Arkansas, Louisiana, Oklahoma and Texas) are benefiting by a wave of industrialization which began several years ago and is being given enormous impetus by this second world war. The movement has been favored by an abundance of excellent natural resources, especially fuel, by cheaper transportation and a milder climate, and by lower taxes and labor costs than in the East and Middlewest. Most of this recent expansion in the area has been within the process industries for it is this group that stands to gain most from the crude petroleum and natural gas for both fuel and sources of many organic chemicals, the sulphur, salt, bauxite, and a long list of other minerals that are the bases of many of the chemical industries. This section probably has a greater array of natural wealth than any other.

In the present emergency, the Southwest is benefiting from the decentralization of defense industries. This policy may be partially explained by the federal government's desire to avoid a repetition of the experience of the first world war, when concentration of war industries in the Northeast caused considerable congestion, and delays in transportation, but more correctly by the advisability of processing the raw materials at or near their source. Although, as a general policy, the government is now locating war plants at inland points several hundred miles from the coast lines, this rule has to be disregarded in some cases, such as the plant for producing magnesium from sea water.

General engineering construction in the Southwest has been at a greatly accelerated rate recently. In 1941, $949,502,000 were spent for new buildings, which compares with only $227,741,000 for 1938, a comparatively normal year. As great as was the building construction last year it was small compared to the rate during the current year when it has been 240 percent greater than in the corresponding five months of 1941. Much of this new construction was for process industry plants. From the accompanying map it may be seen that a large percentage of funds spent last year was for government financed plants and equipment.

The total war contracts for the Southwest, according to the National Industrial Conference Board in the period from June, 1940, to Jan. 1942, reached $2,242,000,000 which had been awarded as follows: Arkansas $214,000,000, Louisiana $355,000,000, Oklahoma $348,000,000, and Texas $1,325,000,000.

Arkansas—This state has a great abundance of natural resources and is ripe for industrial development, but until quite recently it has been content to extract bauxite, petroleum, natural gas and other minerals and ship them out of the state to be processed. However, the present administration at Little Rock has seen the need for greater industrialization and has had considerable success in its efforts to attract industrial enterprises. Arkansas now has an ammonia plant, two kraft pulp and paper mills, several petroleum refineries, and shortly will have a tremendous plant for converting the enormous deposits of bauxite into alumina, and another plant for reducing the oxide to metallic aluminum.

Louisiana—The area around New Orleans has long been a center of process industries, and more recently other centers of manufacturing have

developed, Baton Rouge, Lake Charles, Shreveport and Monroe.

New Orleans is a large producer of alcohol, cottonseed oil, refined cane sugar, heavy chemicals, fertilizers and other products; and recently to these have been added others, such as cement, printing ink, asphalt emulsion and roofing. The first industry of any importance in Baton Rouge was a refinery for processing the petroleum from the oil fields of this and other states. It became a lodestone attracting other plants, acid, alkali (both electrolytic and ammonia-soda) tetraethyl lead and metallic sodium.

Lake Charles is the location of an ammonia-soda plant using salt and oyster shells from sources nearby. Recently a petroleum refinery has been built to process the oil from the fields in the neighborhood. Shreveport has its natural gas and petroleum. Just to the north at Springhill is the largest kraft pulp and paper mill in the United States. And at Monroe is another large kraft mill, an alum plant and other industries. Other kraft mills are located at Bastrop, Hodge and Bogalusa. And scattered over the state are numerous other process industries plants.

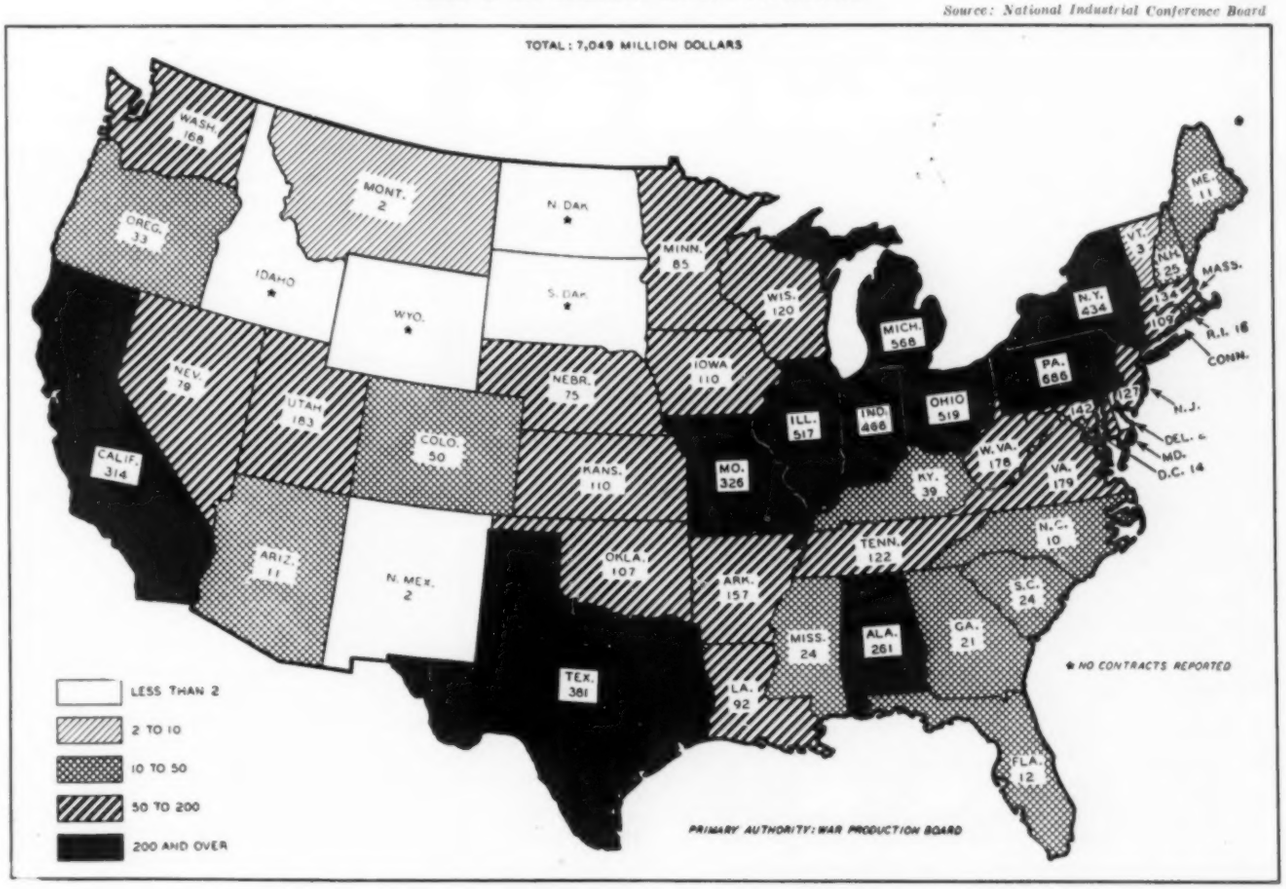
Oklahoma — Although only two generations removed from the Indian settlement period, Oklahoma has made remarkable industrial progress. Today, it is one of the leading producers of petroleum products, with approximately 25 refineries and a large number of natural gasoline plants. One of its cities, Tulsa, is known as the "Oil Capital of the World". However, Oklahoma has diversified industries. Among the most important are: glass containers, cottonseed oil and insecticides. There are several chemical industries, one of the most important is at Tulsa. The products include sulphuric and hydrochloric acids, salt cake and sulphate of potash. At Tallant is located a producer of formaldehyde and methyl alcohol from natural gas. There are only three other producers of formaldehyde in the entire country. Copper sulphate in liquid form for flotation purposes is made in a plant at Cardin. Sodium hypochlorite bleach is made by companies at Bristow, Barnsdale and Oklahoma City. There are two large paint manufacturers at Tulsa and several small ones scattered over the state. Four plants make asphalt emulsions.

Texas—Probably no one needs to be told that the petroleum industry is responsible for much of the industrial progress made by Texas since the discovery of Spindletop near Beaumont in 1901. Directly or indirectly oil has contributed enormously to the trend toward industrialization in the state. There are in the neighborhood of 150 refineries. Several of the largest are producing enormous volumes of chemicals. Others are turning their waste gases over to neighboring plants where they are used in producing synthetic organic chemicals. The utilization of natural gas as a raw material for the manufacture of chemicals has advanced far enough to demonstrate the potentialities in this line.

Until a few years ago the principal industries in addition to petroleum were cotton gins and cottonseed oil mills, cattle, lumber, and sulphur. In 1936, the importance of East Texas pine forests were realized as a source of cellulose. Shortly thereafter a large mill was built on the Houston Ship Channel to produce sulphate pulp and paper, and a newsprint mill was erected at Lufkin. About this time an ammonia-soda plant was located at Corpus Christi.

In the period between June, 1940 and January 1942, contracts for war plants and facilities for the four states of the Southwest reached $737,000,000

Source: National Industrial Conference Board



DATA ON CHEMICAL AND ALLIED INDUSTRIES

Source: Census of Manufactures, 1939

State and Industry	Establishments	Wage Earners[1]	Cost of Materials, Containers, Fuel, & Power,[2] — $1,000	Value of Products,[3] — $1,000
ARKANSAS				
All industries, total: 1939	1,178	36,254	$92,777	$160,167
Cottonseed oil, cake, meal, and linters	26	1,436	14,138	17,341
Fertilizers	8	119	779	1,285
Paperboard containers, n. e. c.	3	102	283	508
Petroleum refining	6	612	11,034	14,328
Chemicals and allied products	15	229	828	1,679
Products of petroleum and coal	3	61	381	726
LOUISIANA				
All industries, total: 1939	1,861	71,218	$365,179	$565,265
Bone black, carbon black, lampblack	6	211	859	2,094
Cane sugar refining	7	3,247	58,110	66,674
Chemicals not elsewhere classified	11	1,269	11,628	32,507
Compressed and liquefied gases[3]	13	93	262	1,024
Cottonseed oil, cake, meal, linters	24	732	6,388	7,824
Fertilizers	12	524	3,288	4,652
Insecticides and fungicides[4]	7	18	60	152
Liquors, rectified or blended	5	21	172	296
Paints, varnishes, lacquers	13	166	1,369	2,084
Paper and paperboard mills	8	2,536	18,253	25,650
Paperboard containers, n. e. c.	9	622	2,675	4,538
Perfumes, cosmetics	5	31	194	403
Petroleum refining	13	2,629	95,483	109,627
Printing ink	4	13	166	441
Pulp mills	7	1,787	8,549	13,817
Roofing, built-up and roll[5]	3	308	2,118	4,156
Wood naval stores	3	307	623	1,419
Paper and allied products	4	59	210	360
Chemicals and allied products	10	497	1,167	3,115
Products of petroleum and coal	1	19	.....	.....
Leather and leather products	2			
OKLAHOMA				
All industries, total: 1939	1,606	28,113	$209,050	$312,168
Compressed and liquified gases[3]	7	44	149	491
Cottonseed oil, cake meal, linters	29	651	4,838	6,142
Glass containers	5	650	1,746	3,341
Insecticides, fungicides[4]	9	25	178	491
Lubricating oils and greases[6]	6	40	578	1,000
Paperboard containers, n. e. c.	4	140	759	1,281
Petroleum refining	27	4,278	88,582	106,667
Chemicals and allied products	21	226	1,150	2,387
Rubber products	3	.....	.....	.....
Leather and leather products	2	.....	.....	.....
TEXAS				
All industries, total: 1939	5,376	126,996	$1,077,115	$1,530,221
Bone black, carbon black, and lampblack	37	1,200	4,654	11,123
Cement	10	1,260	3,935	12,726
Chemicals not elsewhere classified	12	703	2,440	6,479
Compressed and liquefied gases[3]	27	192	490	2,033
Fertilizers	17	192	1,387	2,018
Gypsum products	5	326	856	3,226
Insecticides, fungicides[4]	19	38	447	902
Lime	7	181	221	531
Mineral wool	4	30	36	81
Paints, varnishes, lacquers	25	193	2,380	4,457
Paperboard containers, n. e. c.	17	404	1,524	2,753
Perfumes, cosmetics	12	94	795	1,180
Petroleum refining	113	18,931	576,381	698,850
Rubber products, n. e. c.	7	93	446	816
Soap and glycerin	4	20	104	141
Paper and allied products	16	1,133	4,133	7,952
Chemicals and allied products	20	263	1,324	3,134
Leather and leather products	4	.....	.....	.....

To this plant has been added an electrolytic chlorine plant. Very recently have come a host of other process industries, paint and varnish, soap, glass containers, silicate of soda, etc.

The Southwest is contributing to the war effort. This area, which accounted for only 3.4 percent of the value added by manufacture in 1939, has been awarded 10.4 percent of all government war plants. Much of this has been awarded for construction of plants to produce toluol, butadiene, styrene, ammonia, magnesium, smokeless powder, synthetic rubber, aluminum, picric acid and other materials for the armed forces. Prior to January, 1942, Arkansas had received $157,000,000 for war plants; Louisiana, $92,000,000, Oklahoma, $107,000,000; and Texas $381,000,000. This is a vast change from what happened in the first World War. Industrially the Southwest was neglected and non-industrial facilities were limited largely to air training. Cantonments, other than for air, were mostly in the Southeast.

The retrenchment throughout industry that must follow the cessation of hostilities is not likely to be as serious in the Southwest as in other sections of the country. The area has within its boundaries a large population which has always depended mainly upon the East and Middle West for its soap, glass, steel, paint and varnish, pulp and paper, and other manufactured products. To this ready market for a large volume of goods add attractive conditions for their production, the cheapest fuel to be found anywhere, adequate transportation facilities, splendid native born workers, mild climate, natural resources that can not be duplicated anywhere in this country, and the optimistic view point of the future development of the Southwest is not difficult to see.

POWER IN THE SOUTHWEST

Preliminary as of November 1, 1941

Division and State	No. of Companies	No. of Plants	Total Capacity Kilowatts	Generator Capacity in Kilowatts of Plants Operated by										
				One Type of Prime Mover						Combination of Two or More Types				
				Water Power		Steam Power		Internal Combustion Engines		Total		Water Power	Steam Power	Internal Comb. Engines
				Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Capacity	Capacity	Capacity
United States	1,786	3,872	43,491,371	1,399	11,949,170	1,124	29,777,446	1,132	846,276	217	918,489	266,683	504,098	147,708
West South Cent.	184	414	2,235,720	32	277,893	99	1,718,568	272	201,037	11	38,222	654	25,416	12,152
Arkansas	26	51	155,536	5	67,008	17	69,850	29	18,678	0	0	0	0	0
Louisiana	37	63	419,126	0	0	9	373,770	53	43,606	1	1,750	0	850	900
Oklahoma	58	102	428,920	3	58,800	23	314,698	72	51,832	4	3,590	424	516	2,650
Texas	63	198	1,232,138	24	152,085	50	960,250	118	86,921	6	32,882	230	24,050	8,602

ARKANSAS' natural resourses herald important industrial developments

L. A. HENRY *Director of State Planning Board, Little Rock*

ARKANSAS has long been a producer of bauxite, petroleum and other raw materials for the chemical process industries, but strangely the vast natural resources have been shipped out of the State to be processed. However, this situation is changing. The State appears to be in a state of transition. Governor Homer M. Adkins is actively leading a campaign to industrialize Arkansas and already much progress has been made in this direction.

Pine forests are being converted into pulp and paper in local mills, petroleum is made into numerous products in refineries near the fields, sands are converted into glass, cottonseed oil is processed, and soon the tremendous deposits of bauxite will be converted at nearby plants into alumina and aluminum. The momentum of this trend should be accelerated as the advantages of low cost fuels and the vast potential natural resources of Arkansas become better known.

Bauxite—The largest bauxite producing area in the United States is in central Arkansas. Here the ore occurs in two separate districts—one in Saline County and the other in Pulaski County. The former is by far the larger. The mineral has been mined in the state since the turn of the century. Much open-cut mining still continues, but where the overburden has become too thick for open-cut work, drifts and tunnels have been extended underground followed by sinking of shafts.

Arkansas is now producing approximately 1,000,000 long tons of bauxite ore annually. In 1941, this state was responsible for 95 percent of the domestic production. At the present time a major plant is under construction which will convert the bauxite to alumina. This plant will be in a position to supply alumina not only to the Arkansas reduction plant, which is also now under construction, but also to other aluminum plants throughout the nation. While the entire output of the new metal plant will go directly into the war effort, after the war is over this industrial development will provide an important supply of aluminum for local industrial applications.

Petroleum—Minerals of greatest present economic importance in addition to bauxite are petroleum and coal. These three accounted for about 82 percent of the total value of all minerals produced during 1939. In the southern part of the state there are 28 oil and gas producing fields in six counties; 15 are strictly oil producing fields and 13 produce both oil and gas.

Coal—The area of workable coal lands within the state containing semi-anthracite and bituminous coal is estimated at between 300 and 350 sq. miles. Known reserves of coal are considered adequate for protracted periods.

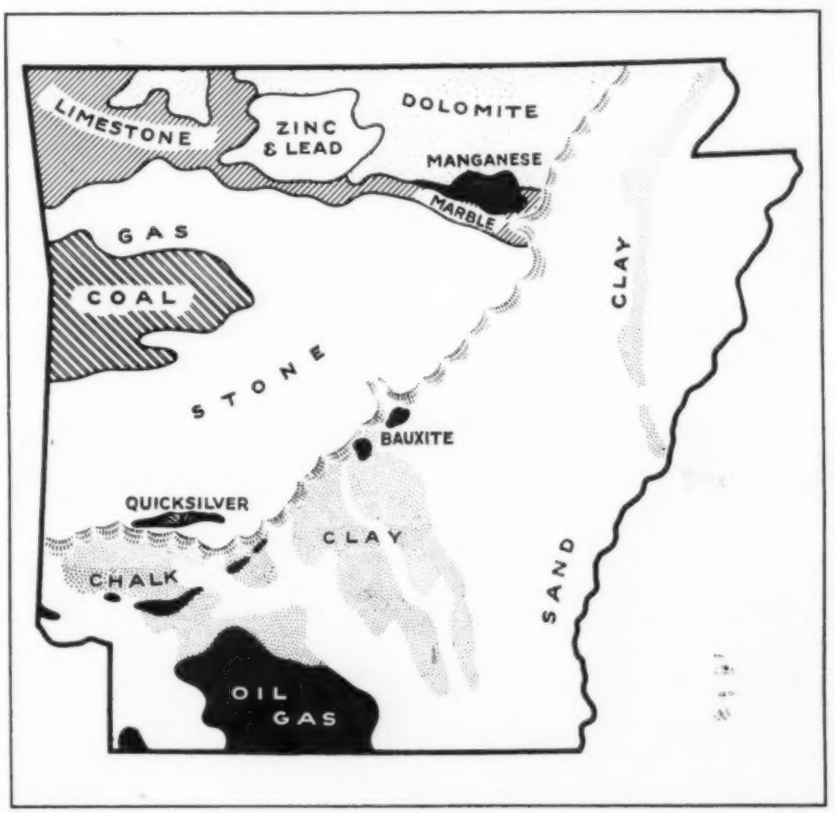
Natural Gas—There are tremendous reserves of natural gas in the state. In 1939 and 1940 the southern fields of Big Creek, Dorcheat and McKamie were discovered. The total developed reserves of this area at the present time exceed 850 billion cu.ft. and are steadily being increased through the discovery and development of new fields. These newly discovered gas reserves offer industry large supplies for fuel or raw material.

The gas is of the sour type, carrying a hydrogen sulphide content which varies from 300 to 4,500 grains per 100 cu.ft. It readily yields to a purification treatment at low cost. Following the desulphurization process the gas is in every respect the equal of sweet gas.

Sulphur—The large reserves of natural gas of the sour type may soon be the source of a supply of sulphur for the production of sulphuric acid and other chemicals. See page 80 of this issue for further information.

Rutile and Brookite—Arkansas is now forging ahead into first place in the United States as a producer of these ores, from which titanium oxide is recovered. A single operation produced uniformly 4,250 tons over a period of eight years. (1934-1941). The available ores are by no means exhausted, there being ample assured supplies to sustain long time opera-

Arkansas is the principal source of bauxite in this country, but also has many other natural resources that are beginning to attract the attention of the process industries managements



tions of several plants equal to or exceeding capacity of the present operations. These ores lend themselves to cheap methods of mining.

Abrasive Materials—Raw abrasive materials such as tripoli or soft silica, novaculite, a variety of chert or massive silica, and chalk for finer abrasives and polishes are available in commercial quantities. In addition to the above, reserves of bauxite are available for the manufacture of aluminum oxide abrasives. At the present time the demand for aluminum metal has limited the amount of bauxite which is made available for abrasives manufacture.

Cement Materials—The resources of cement materials in Arkansas have never been fully utilized. High-calcium limestones, calcareous marls, and fossil shale beds constitute an adequate source of calcium oxide. Large deposits of clay can be drawn upon as a source of Al_2O_3 and silica. Low-grade iron ores are available as a source of iron oxide. Raw materials for a variety of special cements are available. This includes bauxite for aluminous cement, gypsum for rapid setting cements, and dolomite for refractory patching.

Ceramic Materials—A variety of clay types is now being used by ceramic industries in Arkansas. Brick, tile, sewer pipe, and pottery clays are the most prominent types. High grade kaolins and bentonite are available for a variety of ceramic uses. The materials for the manufacture of glass and glass products are being worked in the northern part of the state. Silica sand is the outstanding raw material. Abundant reserves of manganese for coloring certain glasses and for decolorizing optical and lamp glass are available. This source of manganese is also available to manufacturers of porcelain enamel and to manufacturers of colored brick, pottery, and tile.

Fertilizer Materials—The leading potential raw material for a fertilizer industry is the phosphate rock deposits of northeastern Arkansas. The possibility of a cheap source of sulphuric acid from the sour gas fields of southern Arkansas brings considerable attention to these phosphate deposits for the first time. The consumption of super-phosphate in the area west of the Mississippi River is great enough to absorb large quantities of locally produced fertilizer.

Quantities of the agricultural lime have been produced in northern Arkansas for many years. Supplies of dolomite to be used as a filler in fertilizer are very extensive. In the southern part of the state widespread deposits of both chalk and green sand marls are available for use in fertilizer manufacture.

Paint Materials—A wealth of raw materials for paint manufacture are known in Arkansas. It is possible here to mention only such basic raw materials as cottonseed oil, mineral pigments (ochers, umbers, siennas, and terra verte), and a variety of filler materials including tripoli, chalk, fuller's earth, and gypsum. The deposits of titanium oxide may eventually provide the basis for a titanium-white production within the boundaries of the state.

Cellulose—The paper industry is already well established although considerable room for expansion is available. Bulk raw materials in the form of pulp wood and rice straw are available as well as are a number of auxiliary raw materials, such as clay fillers and brown dyes.

Plastics Materials—Arkansas is in a position to foster the growth and expansion of the plastics industry by making available its tremendous supplies of natural gas, oil, coal, and timber as essential, primary requirements. Supplies of cotton are available for the manufacture of cellulose acetate plastics. Immense reserves of lignite, a possible source of raw materials for the plastics field, are widely developed in Arkansas. Byproducts from the paper and lumber mills, such as sawdust and other waste, must be considered as a possible source of material. Fillers, dyestuffs, and similar subsidiary products required by the plastics industry are also present.

Manganese—Two districts in Arkansas are now producing manganese for the steel industry. The largest of these producing areas lies in Independence County in the vicinity of Batesville. The ore from this district ranges from high-grade oxide material containing over 70 percent manganese to low-grade carbonate ores containing a minimum of 18 percent manganese. Construction of a beneficiation plant to treat the low-grade ores is now being planned by the War Production Board. The reserves of low-grade ore are known to be in the neighborhood of 500,000 tons.

Manganese oxides ores are now being produced in Southwestern Arkansas in what is locally known as the "Western District." No accurate estimate of the reserves in this area has ever been made, but in the aggregate the amount of manganese present is very large. A portion of the production from the Western District is now being purchased by the Metals Reserve Co., and stockpiled at Gurdon, Ark.

Arkansas manganese production serves as a source of raw material for the manufacture of dry batteries, porcelain enamel, building brick, glazed pottery, plastics, welding rods, chemicals, varnish, and floor tile. Electrolytic manganese metal is now produced at Knoxville, Tenn. With the advent of additional power facilities a similar plant for Arkansas becomes a strong possibility.

Mercury—Since its discovery in 1932, the Arkansas cinnabar district has grown steadily. The most important deposits are located in a strip nearly 35 mi. long in Pike and Clark Counties in Southwestern Arkansas. Production of mercury in 1941 was approximately 2,000 flasks or over 150,000 lb. Stimulated by favorable market conditions production of mercury in this state is expected to expand to record highs in 1942. Mercury, one of the few metals which is produced in metal form in

Much open-cut mining of bauxite continues in Arkansas. The state is producing 27,254,000 long tons of ore. In 1941, it was responsible for 95 percent of the domestic bauxite production

the state, is used in the manufacture of mercury fulminate, for silvering mirrors and for making drugs, paints, and chemicals.

Zinc—Deposits of zinc ore have been found over a wide area in the northern part of the state. The principal minerals are sphalerite or zinc sulphide, and smithsonite or zinc carbonate. Calamine, or zinc silicate, is present in lesser amounts. Unlike the Missouri and Oklahoma districts where lead and zinc are of equal importance, the zinc ores predominate over the lead ores in northern Arkansas. Smelters are now in operation in the vicinity of Fort Smith in northwestern Arkansas which produce slab zinc. In addition to its metallurgical uses zinc is used as a pigment in the manufacture of paint, rubber and oil cloth, and in various chemicals.

Titanium—Extensive deposits of titanium oxide are now being worked in Hot Spring County, South-central Arkansas. The chief titanium minerals which occur in the county are rutile and brookite. The principal use of the former is in the manufacture of a coating for welding rods. Stabilization of the arc in electric welding and the production of a pure weld metal is achieved by the use of titanium oxide coating on the welding rods. In the form of ferrotitanium, titanium is used for purifying steel and is added to some heat resistant steels to prevent a combination of chromium, molybdenum or other alloying elements with the carbon.

Production of Arkansas' Minerals

Mineral	1940	1941
Barite, short tons	12,086	31,238
Bauxite, long tons	487,677	956,617
Cement, bbl	772,000	915,000
Coal, short tons	1,310,262	1,528,585
Gypsum, short tons	16,828	29,286
Glass sand, short tons	94,970	109,299
Lead, lb	110,000	8,000
Manganese, long tons	7,077	7,157
Mercury, flasks 76 lb	1,221	1,966
Petroleum, bbl	25,866,350	26,465,150
Tripoli, short tons	1,430	2,083
Zinc, lb	880,000	380,000

Mineral Reserves in Arkansas, January 1940

Mineral	Quantity
Barite	1,094,397 short tons
Bauxite (green ore)	25,000,000 long tons
Coal	1,510,063,844 short tons
Lead (metal)	6,900 short tons
Lignite	44,019,000 short tons
Manganese	205,498 long tons
Manganiferous ore	105,313 long tons
Natural gas	
West Arkansas	996,213,000 M cu. ft.
South Arkansas	266,413,460 M cu. ft.
Petroleum	320,148,000 long tons
Phosphate rock	20,000,000 long tons
Zinc (metal)	132,300 short tons

Power — Interconnected power transmission systems provide all the important industrial sections of the state with ample power. In addition to the generating capacity now installed within the state, power is available through a pool consisting of 11 large private concerns and a score of municipal plants. Total generating capacity within the pool is 1,600,000 kw. Surplus from the pool amounts to 235,000 kw. Under construction within the state are steam generating facilities (gas-fuel) for nearly 200,000 kw. and hydro-electric generating facilities for 70,000 kw. Congressional approval of water control projects for construction exist which include 500,000 kw. of hydro-electric generating capacity on the rivers of the state.

Known reserves of coal deposits in Arkansas are approximately three-fourths of a billion tons. Estimated reserves of natural gas in the fields of Southern Arkansas are approximately one trillion cubic feet and the fields are being extended constantly by new exploration.

Such a balance for steam and hydro generation exists nowhere else between the Allegheny and Rocky Mountains which will afford as low-cost electricity as in the potential Arkansas developments.

Climate—The climate of Arkansas is mild at all seasons. No long extremes of hot or cold occur. The average annual precipitation is 48 in. well distributed. There is an average of 105 rainy days and few of these interfere with flying. Fogs are rare. The temperature averages 61.4 deg. F. throughout the year. Extremes of short duration are rarely above 100 deg. or under 0 deg. Because of mild winters, fuel costs for plant heating are low. Air conditioning in summer is not essential.

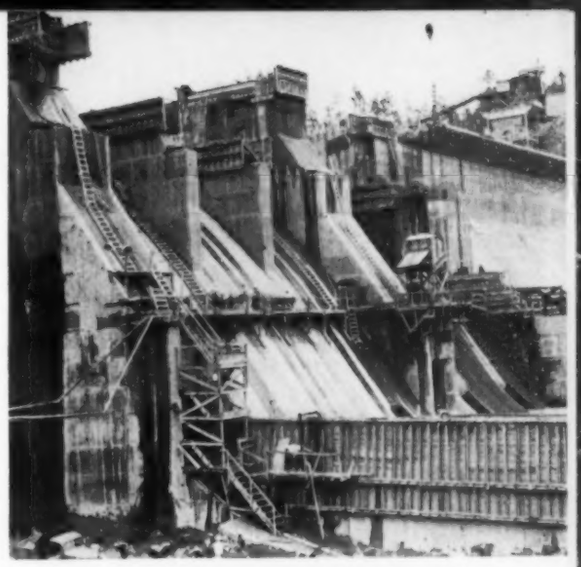
Transportation — Approximately 5,000 mi. of railroads criss-cross Arkansas. Among these are five trunk line systems interconnecting the industrial middle west, east and gulf coastal cities.

Over 9,000 mi. of highway system, fed by 40,000 mi. of local roads, serve all sections of the state and connect with the major transcontinental road systems in all directions. Of the state highway system, more than one-third is paved and the balance gravelled.

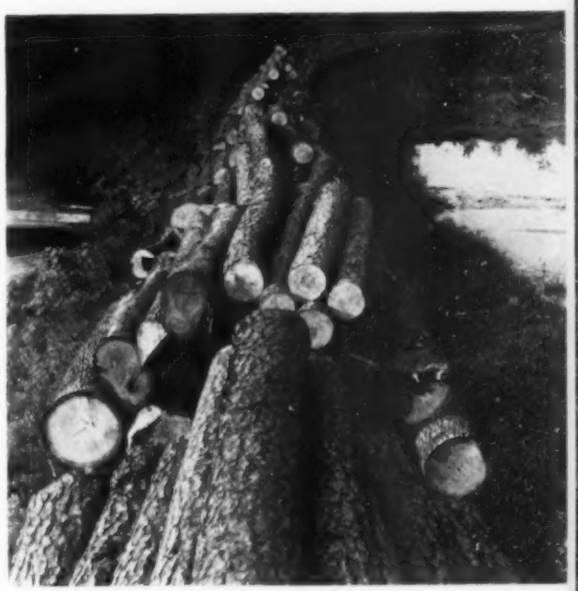
Waterways provide means of freight transportation along the entire eastern boundary and into the interior of the state along the Mississippi, Ouachita and White Rivers.

Commercial airlines operate across the state with several scheduled stops at Little Rock. The airlines afford good connections at Memphis and Dallas to all important centers. There are over 30 airports in the state.

Labor—White native labor is pure Anglo-Saxon stock, loyal, industrious, and readily trained. Twenty-five percent of the population is black. Over 99 percent of the population is American born. A large vocational training program is underway for both whites and negroes. The skills learned in defense industry and in the armed services are certain to afford the state many times the number of skilled workmen upon the cessation of the war. Only about 12 percent of those gainfully employed were engaged in manufacturing enterprises, leaving a reservoir of potentially available labor which is capable of broad adaptability.



Interconnected transmission systems provide all the important industrial sections of the state with ample power



The pulp and paper industry is already well established although considerable raw materials in the form of wood and rice straw are available for expansion

LOUISIANA'S attractions to industry are difficult to duplicate

JAMES A. LEE *Managing Editor, Chem. & Met.*

LOUISIANA is a veritable treasure-house of the natural resources, sulphur, salt, lime, cellulose, petroleum, natural gas, etc., that are the background of the chemical process industries. To this cornucopia of resources add the temperate climate, harmonious labor conditions, excellent transportation facilities, reasonable fuel and power, and you have a combination of attractions that are difficult to duplicate.

The list of these natural resources is a long and impressive one.

Petroleum—The state's No. 1 natural resource is oil. An average annual production of 100,000,000 bbl. of crude oil gives Louisiana fifth place in the United States. Oil is found in many areas in various parts of the state. In addition to the allowable production the potential capacity of the wells is, of course, much greater. Much drilling in the coastal parish salt domes and in the prospective deeper sands, needs to be done. There is much room left in both the coastal areas and in north Louisiana territory for deeper drilling. Developments at present indicate that several interests are about to begin such programs.

Not only is the crude oil from the Louisiana fields refined within the state but even greater quantities are shipped in for refining from Kansas, Oklahoma, Texas, Arkansas, California, Mexico and Venezuela. The value of refined products turned out by Louisiana refineries annually was estimated, not long ago, at approximately $200,000,000.

Natural Gas—In 1940, there were produced in Louisiana more than 300 billion cu.ft. of natural gas, three-fourths of it was used in its original state, while the remainder was transferred into gasoline and carbon black. Thirty gasoline plants in 15 oil and gas fields annually extract more than 100,000,000 gal. of gasoline from natural gas. The productive fields may be grouped into three general areas, the Sabine Uplift centering around Shreveport in the northwestern part of the state, the Monroe-Richland-Epps gas area in the northeast, and the Gulf Coastal salt dome area along the Gulf shore. Pipe lines distribute the gas to all sections of the state.

Cellulose—More than one-third of the state is forest land. There are 16,211,000 acres of farm woodland and industrially owned tracts. Forest products annually amount to $50,000,000 while the finished products are valued at twice that amount. Pulp and paper consume some of the timber. Largest mills are at Monroe, Bogalusa, Bastrop, Springhill and Hodge.

Among the other materials from which cellulose products are being made should be mentioned bagasse and rice straw. The sugar cane supplies a large tonnage of bagasse which is converted into wall board, and Louisiana is the largest rice growing state in the nation.

Salt—This is one of Louisiana's most valuable natural resources. There is no means by which to determine the reserves of salt underlying the surface, most of which is beneath the parishes of Iberia and St. Mary in South Louisiana and Winn in North Louisiana. However, after a production totalling millions of tons, the surface of these remarkable deposits have hardly been scratched. It is safe to say that the supply will out-date the lives of this and quite a few generations to come. The formation containing salt that in its unmined, natural state is 99 percent pure is usually in the form of a large dome, one or two miles in diameter and thousands of feet deep. There are at least 25 other points besides those mentioned above where salt is to be found in commercial quantities.

Sulphur—Production of this mineral in 1940 totaled 512,935 long tons. It all came from operations at Grande Ecaille, Plaquemines Parish. Louisiana is the second largest producing state with nearly 19 percent of the total domestic output, standing second only to Texas.

Power—Electric power is available throughout the state. In 1939 there were produced 1,885,223 kw., all of which originated from fuel-operated plants since there are no hydroelectric plants. In addition to the expansion of some of these plants which now is going forward, an adequate supply of power is assured by the network of transmission lines with interstate connections.

Sweet Potatoes and Peanuts—Among crops produced on a commercial scale and adaptable to industrial use are sweet potatoes and peanuts. 6,935,000 bushels of the former and 18,800,000 lb. of the latter are raised annually.

Lime—One of the most important mineral deposits of the state is the deposit of limestone at Winnfield, in Winn Parish, in the north central section of the state. This deposit has for years been the source of a large part of the state's requirements of limestone. It is served by three railroads. The existing quarrying plant has a capacity of 24,000 tons per month. The stone has a calcium carbonate content of 98.3 percent and silica of 0.6 percent.

The extensive shell reefs of South Louisiana yielding 97 percent calcium carbonate afford a source of lime as yet little developed. In one recent year 701,555 cu.yd. of oyster shells, much of which was converted into lime, and 194,052 cu.yd. of clam shells were recovered. These deposits are located in Iberia, Vermillion, St. Mary, and Terrebonne Parishes. One deposit has been proved to a depth of over 20 ft. and is estimated to contain over 50,000,000 cu.yd. The Pointe au Fer reef, lying in St. Mary and Terrebonne Parishes is by far the largest deposit of this material yet found, and is estimated to contain approximately 100,000,000 cu.yd. of shells.

Gypsum—In Calcasieu Parish in the western part of the state, beds of gypsum have been estimated to be from 100 to 540 ft. thick. And reliable information indicates gypsum is also available in commercial quantities at Winnfield in Winn Parish.

Lignite—The northwestern part of the state contains extensive deposits of lignite or brown coal, but the abundance of bituminous and anthracite coal available from other fields, as well as gas and oil within the state, have not yet made the exploration of these lignite fields commercially practicable. Lignite in seams varying in thickness from 2 to 8 ft. exists in Caddo, Webster, De Soto, Catahoula, Sabine, Rapids, Bossier, Bienville, Winn, Lincoln, Ouachita, Avoyelles, Caldwell, East Carrol, Iberia, Jackson, Natchitoches, Red River and Claiborne Parishes.

Cottonseed—Since 1880, from a

small beginning, the crushing of cottonseed has developed into a very important industry. The crush for a typical year amounts to 232,682 tons with a value of $10,823,000, a little more than one-half is cake and meal, 106,545 tons, with a value of $3,819,000, hulls 63,000 tons with a value of $516,000, and linters 49,498 bales with a value of $950,000.

Sugar Cane—This crop flourishes in the fertile delta lands in the "Sugar Bowl" of the southeastern section. Louisiana has the distinction of being by far the largest producer among the states, Florida contributing a much smaller amount. Highest production of sugar cane in history was the 1938 crop of 6,237,000 tons, valued at more than $16,000,000. The cane supplies material for the 77 raw sugar mills of the state, molasses for the alcohol plants and bagasse for the wall board industry.

Transportation — Facilities are available for every type of transportation. Rail, bus, water and air traffic lanes reach every section of the state, making travel quite convenient and providing the means by which every product and raw material may be shipped. Great strides in this direction have been made by Louisiana within the past few years. She has more than kept pace with the nation in this respect.

Water transportation has long been splendid. Blessed by an inland waterways system, the extent of which is unequalled in any state in the country, crossed by the Intracoastal Canal, and situated on the Gulf of Mexico, with the mouth of the great Mississippi River within its boundary, it is no wonder that the state's water transportation system is one of her most valuable possessions. Steamships from every quarter of the globe enter Louisiana's ports, and barges and steamboat service reach nearly every section of the state through the courses of the myriad of navigable rivers and bayous.

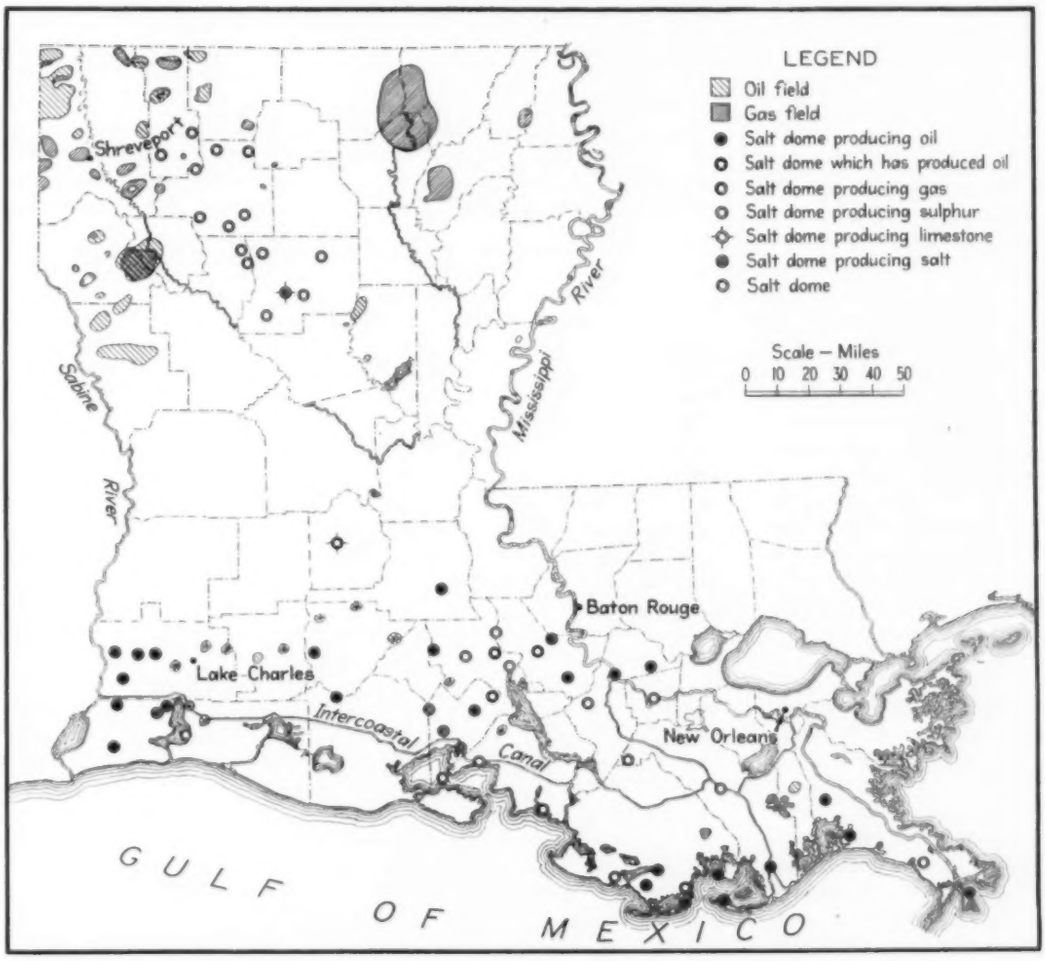
Twelve important railroad systems offer fast and efficient service through which every section of the country can be reached. They traverse the state. These railroads, like steamboats and steamships, have played an important part in the development of Louisiana.

Thirty-five motor freight lines and the same number of passenger bus lines operate over the extensive system of highways and bridges which comprise 40,000 miles, of which there are 2,350 miles of concrete, 1,600 miles of asphalt and 14,000 miles of gravel.

Labor—Conditions in the state, both from the standpoint of the manufacturers and the industrial workers, are extremely satisfactory. There have been very few labor disputes. Ninety-five percent of the population is native born, 28 percent of the native born being negroes. The supply is adequate.

Soybean—Only ten years ago soybean production was practically negligible. But today there are raised on an average of 1,500,000 bushels of soybeans annually—the fifth largest production in the United States.

Louisiana offers the process industries salt, sulphur, lime, petroleum, natural gas, and a variety of other resources. New Orleans has long been a center of production of alcohol, cane sugar, cotton seed oil and other products



OKLAHOMA offers exceptional inducements to process industries

ROBERT H. DOTT, A. L. BURWELL, J. O. BEACH *Geological Survey. Norman, Oklahoma*

FEW STATES can offer the chemical process industries a greater variety of basic mineral raw materials, or a greater quantity of cheap fuel, than Oklahoma. Water supplies are adequate, at least in certain areas; transportation is ample; and sufficient labor for most operations should be available, although some technical skill would have to be imported for some types of industries.

Oklahoma's position in respect to its ability to supply industry with basic raw materials can be comprehended clearly by measuring the relative importance of the geologic raw materials as determined by a consideration of the various factors involved. Such a study has been made for many of the more important industrial chemicals and the raw materials classified in order of their relative frequency in use. (Keller, R. N., and Quirke, T. T., "Mineral Resources of the Chemical Industries," *Economic Geology*, Vol. 34, No. 3, May, 1939, pp. 287-296).

If we take this tabulation, and add information showing the quality and extent of each material available in Oklahoma, it is immediately apparent that Oklahoma offers exceptional inducements for the chemical manufacturer.

Coal—Steaming coal is available in nearly all of Eastern Oklahoma. Semi-bituminous coal for smokeless fuel is mined in the extreme eastern part of the state. It has been established by research at the U. S. Bureau of Mines and by individual concerns interested in the matter that proper blends of Oklahoma coals will yield satisfactory metallurgical coke. Byproducts from such coking or from low-temperature carbonization certainly hold promise. So too, the preparation from coal of ion-exchange material for water treating, and the like, should be considered.

Sulphur—Although sulphur, as such, is not found in Oklahoma, it is available from the adjoining state of Texas and with moderate transportation costs. Also, byproduct sulphur from sour oil and gas may become of importance.

Mineral Salt—Salt is recovered from springs and plains on a minor scale, and production could be increased should demand arise.

Limestone—Extensive deposits of rock of "high-calcium" classification occur in several areas. The purity of lime from these sources is sufficiently high for most chemical requirements. Burned lime is made in three plants. In addition to stone for block and crushed material, there are a number of impure limestones which contain the proper proportions to serve as high-grade wool-rocks, and one plant is in operation, using local stone. The state has two cement plants, one with a carbon dioxide byproduct unit.

Sulphide Ores—The Miami District of northeastern Oklahoma is recognized at present as the leading source of lead and zinc sulphide ores. There are several other regions in the state from which reports have come indicating additional supplies.

Brines—There have been two attempts made to utilize the oil-field brines of the state in chemical manufacturing, namely—Texaco Salt Co. at Tulsa, and Texas Carbon Co. at Sayre, but far greater effort and capital have been expended on disposing of the brines which are produced with the petroleum oil, than in conversion to industrial uses.

Iron Ores—Moderate quantities of iron ores are present as limonite, hematite, and titaniferous magnetite. There are relatively small scale operations in limonite deposits of Arbuckle Mountains to supply requirements of cement plants for special cements, and some ore has been shipped to foundries in the state. Some consideration is being given to their use in blast-furnace operations in Texas and elsewhere.

Petroleum—Although large quantities of refined products are being made within the state from petroleum, 60 percent of the state's production is pipe-lined to outside refiners. From the crude oil within the state are made gasolines of several grades, burning oils, fuel oils, gas oils, lube oil, and paraffin wax, as well as special solvents for the paint, lacquer, and insecticide trade.

From casinghead gas—the gas produced from oil wells, with petroleum—is extracted the dissolved high-gravity gasoline, as a condensate. Byproducts include such fractions as butane, pentane, propane, etc., which are sold as such, but which should be utilized by conversion through chlorination, oxydation, etc., into various derivatives.

Natural Gas—Although natural gas (methane) is considered primarily as a fuel and a very desirable one, one company in Oklahoma is now a major factor in the production of acetalde-

MINERAL PRODUCTION OF OKLAHOMA, 1937-38*

Products		1937 Quantity	1937 Value	1938 Quantity	1938 Value
Asphalt (native)	tons	(1)	(1)	(1)	(1)
Carbon, black	lb.	(1)	(1)	(1)	(1)
Cement	bbl.	(1)	(1)	(1)	(1)
Chats	tons	3,991,700	$410,675	1,504,900	$216,370
Clay:					
Products		.....	583,334	.....	572,289
Raw	tons	(1)	(1)	(1)	(1)
Coal	tons	1,600,295	3,841,000	1,244,732	2,947,000
Gypsum (crude)	tons	159,639	266,091	141,341	231,910
Lead	tons	29,840	3,521,120	21,004	1,932,368
Lime	tons	(1)	(1)	(1)	(1)
Natural gas	M. cu. ft.	296,260,000	32,039,000	263,164,000	27,391,000
Natural gasoline	gal.	492,290,000	20,272,000	468,499,000	14,373,000
Ores (crude), etc.:					
Zinc	tons	6,644,400	(6)	4,249,000	(6)
Zinc-lead	tons	3,787,600	(6)	3,072,400	(6)
Petroleum	bbl.	228,839,000	283,500,000	174,994,000	209,500,000
Pumice	tons	(1)	(1)	(1)	(1)
Salt	tons	(1)	(1)	(1)	(1)
Sand and gravel	tons	934,499	414,495	823,814	354,486
Stone	tons	1,098,790	1,149,624	(9)1,101,320	(9)1,338,858
Sulphuric acid(7)	tons	(1, 2)	(1, 2)	(1, 2)	(1, 2)
Tripoli	tons	(1)	(1)	(1)	(1)
Zinc	tons	135,696	17,640,480	112,924	10,840,704
Miscellaneous(8)		.....	4,338,213	.....	3,636,013
Total value, eliminating duplications		.....	$367,444,222	.....	$272,860,078

*Source, 1939-40, Report of Okla. Geological Survey.
(1) Value included in "Miscellaneous."
(2) Value not included in total for state.
(6) Not valued as ore, value of recoverable metal included under the metals.
(7) From zinc smelting. Sulphuric acid also manufactured in state from Gulf Coast sulphur.
(8) Includes minerals indicated by (1) and (9) above.
(9) Exclusive of dimension stone, value for which is included under "Miscellaneous."

hyde, formaldehyde, acetone, acetals, and methanol, all by catalytic oxidation of natural gas.

Potassium Minerals — Potassium minerals are not produced in Oklahoma but eastern New Mexico is the largest producer in the United States. An Oklahoma chemical company is now converting such material into potassium sulphate for the trade, and making muriatic acid as a byproduct.

Gypsum—Gypsum, including alabaster variety, is present at the surface over a considerable area in western Oklahoma. Present operations include quarrying of raw rock gypsum to supply the needs of cement plants in the Southwest; one manufacturing plant making several gypsum products, such as plaster, wall board, etc., and a calcining plant.

Lead Ores—Oklahoma lead ores are chiefly the sulphide mineral galena; considerable quantities are mined in the state, but at present little or no chemical use is being made of these ores locally.

Sand—Various grades of sand are widely distributed over the state, but the higher silica, glass sand grades are found in three main areas: Arbuckle Mountains, southern row of counties east of Ardmore, and small areas in northeastern Oklahoma. Three operators are engaged in quarrying glass sand in the Arbuckle Mountains to supply a large portion of the requirements of the Oklahoma and north Texas glass industry. However, these sands are not used in chemical industries at present.

Phosphate Rock—There is probably a sufficient quantity of phosphate rock for local use only, but there is no utilization at present.

Magnesium Minerals—There are abundant, thick deposits of high-grade dolomites in Arbuckle and Wichita Mountains, but no industrial use at present, except as used with limestone for crushed stone, and one small operation for agricultural use.

Zinc Ores—Zinc sulphide is mined in large quantities. Three smelters are operating in the state, producing slab zinc with cadmium and sulphuric acid as byproducts. Small amounts are used for galvanizing.

Barium Minerals—Some prospecting and minor mining of barium sulphate is reported, but no processing of this material is going on in the state.

Titanium Ores—Considerable quantity of titaniferous magnetite is present in the Wichita Mountain area, containing up to 16 percent titanium oxide. Possibly some black sands in that area contain recoverable ilmenite. But no industrial processing is done.

Mineral wool filters for removing inpurities out of sulphur dioxide gas in sulphuric acid plant of Ozark Chemical Co.

FUELS AND POWER

Fuels can be had in abundance from three sources: coal, petroleum, and natural gas. An estimated 55 billions of tons of minable coal underlie Eastern Oklahoma; estimated proven petroleum reserves of 1,035,820,000 bbl. are located in 42 of the state's 77 counties; and natural gas is produced in these same and half a dozen other counties. New industrial plants could be located in almost any section of the state within easy reach of fuel supplies.

Coal—Two ranks of coal are represented, bituminous and semi-bituminous. Low-volatile coals are mined in the eastern area, chiefly in Haskell, Latimer, and Le Flore Counties. The principal production of high-volatile coal comes from the McAlester, Henryetta, and northeastern districts.

There is some variation in sulphur and ash content—coal from the eastern, McAlester, and Henryetta districts being somewhat lower in both, than are coals from the southwestern (Coal County) and northeastern districts.

There is probably ample labor and facilities available to step up production without any great shifting of labor and equipment from other areas. Average value of coal produced in Oklahoma was $2.36 per ton in 1938, and $2.11 in 1939. (Minerals Yearbook, U. S. Bureau of Mines).

Petroleum—Production of petroleum during the past ten years has ranged between 153,000,000 and 228,000,000 bbl. per year.

Natural Gas—Oklahoma has extensive reserves of natural gas, and during the past several years has been producing at the rate of about 270 billion cu. ft. per yr. Largest available supplies at this time are probably in Caddo and Grady Counties, but adequate supplies for industrial use can be obtained in almost any desired location, either from local production or through the extensive gathering and distribution systems of distributing companies. Natural gas for industrial use can be purchased at low rate.

Electric Power—Commitments for defense-training establishments, ordanance and other war industry plants, and a proposed pooling of power from Oklahoma and Arkansas, to supply an aluminum reduction plant in the latter state, has decreased the power reserve, but it has been stated by persons in position to know, that a considerable reserve of firm power is still available.

The state is served by several public utility companies, a 60,000 kw. hydro-electric plant in northeast Oklahoma, and several communities have municipally-owned generating plants. The public utility lines are

interconnected with each other, and with the hydro-electric plant, so that electric power is available in all parts of the state.

In discussing the availability of power for industrial use one should not overlook the possibility, in certain industries at least, of ultilizing off-peak power, which is always available in large quantity and at low cost. Consideration also should be given to the fact that Oklahoma probably is in no different position than other sections of the country in regard to power shortage. If new plant construction in the nation demands construction of new generating capacity, Oklahoma's abundant and conveniently located fuel supplies can provide all necessary electric energy in close proximity to new industrial plants, without further disrupting the transportation system of other sections of the country.

Oklahoma Petroleum Refineries

Number of refineries May, 1941	25
Daily capacity crude oil (bbl.)	210,280
Daily cracking capacity (bbl.)	96,300
Number gasoline plants April, 1941	105
Rated capacity daily (bbl.)	1,912,050

TRANSPORTATION

Oklahoma is served by four major trunk-line railroads, with connections to all parts of the United States. These are: Missouri-Kansas-Texas; Chicago, Rock Island and Pacific; Atchison, Topeka and Santa Fe; and St. Louis-San Francisco. These, together with a smaller group of connecting lines: Kansas, Oklahoma, and Gulf; Midland Valley; and Oklahoma City, Ada, and Atoka; as well as a branch of the Missouri Pacific, and a few short, local lines; reach into every county, and practically every county seat town.

The state has built and maintains an excellent system of highways. Except in the more remote, mountainous area, secondary roads give access to any locality in the state.

POSSIBILITIES

An investigation of each item—its frequency of use—its relative importance in the chemical processes—its relative cost—its cost where transportation is a factor—will indicate the advantageous position of chemical industries located in Oklahoma. Not on one or two items alone, but on a large percentage of the 15 most prominent items, Oklahoma is in a favorable position. This is worth considering because the interdependence of chemical industries among themselves is recognized. This interdependence would indicate the advisability of centralization where the greatest number of the more essential raw materials and fuel are available, as in Oklahoma.

To all persons interested in chemical industry, Oklahoma cordially invites your consideration. It offers possibilities and inducements in far greater measure than is generally realized. The Oklahoma Geological Survey, at Norman, will furnish on request available information to anyone interested.

Basic Geologic Raw Materials for Industrial Chemicals, Availability in Oklahoma

Material	Frequency Index *	Availability	
		Oklahoma Sources	Sources in Region
Water	99	Surface and underground supplies adequate in some areas.	
Coal	91	55 billion tons reserve. Bituminous and semi-bituminous. Shaft, slope and strip mining; 1 to 2 million tons annually.	
Sulphur	88	None	Texas and Louisiana Gulf Coast.
Mineral salt	75	NaCl in salt springs and salt plains. Subsurface salt beds. Little or no development.	Kansas, Texas, Louisiana.
Limestone	63	Great abundance above 95% $CaCO_3$. Abundance 98 and 99+% $CaCO_3$. Several quarries, many quarry sites.	
Sulphide ores	32	Leading producer of ZnS, important PbS production. Reserves of present-grade ores somewhat limited. Ores from other states brought in for smelting.	
Brines	24	Oil field brines in all oil-producing areas.	
Petroleum	23	Produced in 42 counties. Annual production 200 million barrels; third in nation.	All surrounding states.
Natural gas	16	Essentially same areas as petroleum, plus two important dry gas areas. Fourth in national production. Third in production of natural gasoline.	Large reserves in surrounding states, with trunk pipe lines.
Potassium salts	11	None known	Potash mines in eastern New Mexico.
Gypsum	10	Great abundance, easily obtainable. Considerable production.	Kansas and Texas.
Lead ores	9	With zinc in northeastern part of state. Tri-State area. Reserves somewhat limited.	
Sand	9	Various grades, including high-grade glass sand in abundance. Considerable production in Arbuckle Mountains.	
Aluminum minerals	8	No high-alumina materials known.	Bauxite in Arkansas.
Iron ores	6	Limonite in Arbuckle Mountains, titaniferous magnetite and low-grade hematite in Wichita Mountains.	Limonite in East Texas.
Phosphate rock	6	Low-grade deposits in several areas. Small supply of high-grade nodules. No production.	Northern Arkansas.
Copper ores	4	Small, very low-grade deposits. No production.	
Magnesium minerals	3	Great abundance of high-grade dolomite. Moderate concentrations in some oil-field brines.	
Mercury ores	3	None definitely known	Produced in southwest Arkansas, adjacent to southeast corner of Oklahoma. Produced in Texas.
Zinc ores	3	At present leading producer in nation. Tri-State area. Reserves somewhat limited. Some ore from other states smelted in Oklahoma because of abundant fuel.	
Antimony minerals	2	None known	Known in western Arkansas, adjacent to eastern Oklahoma line.
Barium minerals	2	High-grade barium sulphate in two areas. Quantity not known. Some prospecting in progress.	Arkansas and Missouri.
Manganese ores	2	Carbonate and oxide ores in Arbuckle Mountains; oxide ores in Ouachita Mountains. Quantity not large. Small amount mined.	
Titanium ores	1	Titaniferous magnetite ores in Wichita Mountains. Magnetite-ilmenite sands in streams of that area.	Rutile in Arkansas.

* Frequency index number is the number of times the particular mineral is used as raw material in the production of 150 important industrial chemicals, as found by Keller and Quirke. In general these numbers are an index of the relative importance of the various raw materials for making industrial chemicals.

TEXAS is abundantly endowed with cheap fuel and variety of minerals

ROBERT L. DABNEY *Director of Research Department, Houston Pipe Line Co.*

A STATE with an area of 265,895 sq.mi., or the combined size of New York, New Jersey, Delaware, Pennsylvania, Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire and Indiana, necessarily offers a great variety of topography and climate. Texas has these and, in addition, is abundantly endowed with mineral wealth. It now tops every other state in the Union in mineral production. It is producing approximately 15 percent of the total annual mineral value of the entire country. Petroleum contributes the bulk of this great production, nevertheless, it has a highly diversified mineral industry. Thirty classifications of minerals are produced on a commercial basis. The increase in the mineral production of Texas has been the most spectacular phase of the Texas economy since the beginning of the century. The enormous supplies of natural gas, petroleum and coal give the state the most economical fuel to be found anywhere. It has been said that Texas is at the cross-roads of North American geology.

Petroleum—Texas is estimated to have 53 percent of the known petroleum reserves of the country. And it is interesting to note that year after year authorities have made upward revisions of the state's underground reservoirs. The following tabulation gives the record of increase of production in the state.

Year	Production (bbl.)
1890	54
1900	836,039
1910	8,899,000
1920	96,868,000
1930	290,457,000
1940	493,000,000

Sixty-eight percent of this crude petroleum is refined in the state.

It is as a fuel that petroleum holds its greatest potentiality for the state's industrial future. Adaptable to use in steam and Diesel and other internal combustion engines, it is an all-round fuel that ranks second only to natural gas in convenience and adaptability to purpose. However, crude petroleum is the source of numerous products such as gasoline, medicinal oils, lubricants, candle wax, detergents, and recently has become the basis of an important synthetic organic chemical industry in the state.

Natural Gas—In 1939 (the last year for which a complete report is available) Texas produced 1,330,000,000,000 cu.ft. of natural gas, which was 40 percent of the production of the country. It was the opening of the great Texas gas fields and extension of long distance, high-pressure lines that brought about the transition of natural gas from a localized to a nationwide utility. Pipelines radiating from the gas fields carry the fuel at high rates of speed making it available to industry all over the state. Natural gas has been called the ideal fuel. Already it has been instrumental in bringing numerous industries to the state.

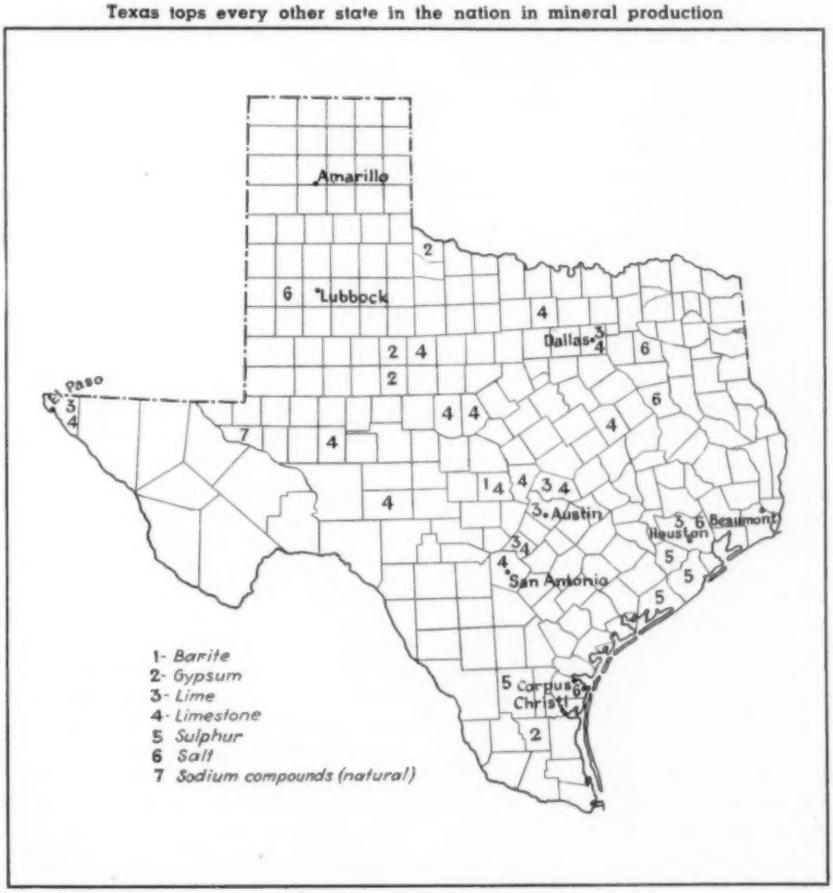
The principal industrial production into which gas enters as a raw material is the production of carbon black. The so-called "wet" gas of some fields is utilized for extraction of natural gasoline. In recent years there has been rapid progress in the manufacture of liquefied gas from natural gas. At present gas is coming into demand as a raw material for many synthetic organic chemicals such as butadiene for rubber production.

Coal and Lignite—There is in addition to oil and gas, a great fuel and power resource in deposits of coal and lignite. However, relatively little of these materials are mined in the state at the present time. These resources may be considered a dormant but potentially great industrial asset.

Sulphur—Approximately 1,300,000 tons of sulphur are produced annually in Texas. It comes primarily from three or four counties which are in a radius of 65 miles of Houston. It is now producing about three-quarters of the United States production of sulphur. Sulphur has tremendous potentiality as an influence in the future development of Texas because of its key position in chemical industries. In some form or other sulphur enters into a large percentage of chemical products.

Cellulose—In 1936, the importance of East Texas pine forests were realized as a source of cellulose. It was during this period that a large mill

Texas tops every other state in the nation in mineral production



was established on the Houston Ship Channel to manufacture sulphate pulp and paper, and shortly thereafter the much discussed Herty process for making newsprint from southern pine was finally realized by the construction of a mill in East Texas. Two years later the first mill for making coated paper was built to utilize a portion of the sulphate pulp made on the Houston ship channel.

The Texas Gulf Coast each year produces large quantities of rice. Over 260,000 acres are planted to rice near Houston. After the harvest there is available annually 340,000 tons of rice straw within a radius of 65 miles of Houston. This straw is now either burned or fed to cattle as roughage. It is possible to bale the straw and ship into the Houston area at a nominal figure.

Lime—The oyster shell deposits immediately tributary to Galveston, Texas City, Houston, and points along the Houston Ship Channel are those in Galveston Bay. From accurate data available it is safe to say that there is a minimum of 150,000,000 cu.yd. of shell in Red Fish Reef alone, and that altogether in Galveston Bay there is at least 250,000,000 cu.yd. of shell that can be utilized for many purposes.

The shell deposits that are immediately tributary to Orange, Port Arthur and Beaumont, are those in the Calcasieu River, Calcasieu Lake and Sabine Lake. The deposits in the last of these, which lies in Louisiana, are relatively small, not over 2,000,000 cu.yd. being available in the entire lake. Shells can be towed from Galveston Bay through the Intracoastal Canal, provided large quantities are involved, as the tow is rather a long one and is an expensive proposition.

In Matagorda Bay immediately tributary to Port La Vaca, Palacious and Matagorda and Port O'Connor, it is estimated that there is at least 150,000,000 cu.yd. of shell. In San Antonio Bay and Aransas Bay, immediately tributary to Seadrift and Rockport, there is available 100,000,000 cu.yd. of shell. Corpus Christi Bay is an exception in regard to shell deposits as compared to other bays on the Texas Gulf Coast. It is estimated that there is not over 10,000,000 cu.yd. Nueces Bay has between 6,000,000 and 8,000,00 cubic yards of shell. So it can be readily seen from the above figures that the amount of shell available from various deposits along the Texas Gulf Coastal area is sufficient for a great many years regardless of increased consumption.

Clays—Bleaching clay has for several years been a large industry in Texas. Numerous deposits occur in a geological formation, outeropping at various points in an arch roughly paralleling the Gulf Coast shore line 150 miles inland. The first development of these clays was south of San Antonio, however, as better deposits were found, and as those deposits being worked became depleted, the industry has moved eastward. At the present time the largest producers of fuller's earth in Texas are located in the vicinity or just north of Houston. Several virgin deposits are known to exist in two of the most easterly counties. These deposits have been explored, surveyed and tested to ascertain their quality, ability to activation and amounts in place. Two of these deposits in particular contain in the neighborhood of 2,000,000 tons each. These deposits are well located as to railroads, water sources, and markets.

Dolomite—Large deposits of dolomitic limestone are found in Blanco, Gillispie, Llano, Mason, Burnet, McCulloch, San Saba, Lampasas, and Williamson Counties. These deposits have two railroads serving them—the Santa Fe and the Southern Pacific.

The material is a medium grain crystalline dolomitic marble with secondary dolomite infiltration. The deposits range in thickness to several hundred feet, with very little overburden. The exposed faces are often ten to twenty miles long. Some of this material has in the past been mined and used as marble.

Analyses of several samples of this material follow:

	1	2	3	4	5	6
Silica	5.00	3.00	3.33	4.30	3.32	0.62
Alumina	2.54	—	5.43	8.48	12.88	.74
Oxide of iron	1.96	1.80	3.18	.33	.25	Trace
Lime	30.32	28.98	29.38	27.03	28.62	33.00
Magnesia	15.14	20.40	14.32	14.99	10.81	18.56
Carbonic Acid	40.47	43.70	42.00	41.70	40.00	46.66
Loss on Ignition	4.49	2.46	3.00	3.69	2.58	.50
	99.92	100.34	100.64	100.43	93.66	99.58

Iron Ore—Iron ores are known to exist in many counties of the state, but for present commercial purposes, two centers are of outstanding interest; the northeastern region and the central area in Llano and Burnet Counties. The former consists of some 20 counties 150 to 200 mi. north of Houston.

The tracts considered most promising are in Cass, Marion, and Morris Counties. These counties are served by the International-Great Northern (Missouri Pacific) Railroad, and from Cherokee County via Southern Pacific. The Llano-Burney area is located about 230 miles north and west of Houston.

Salt—Salt is certainly a large contributing factor to Texas industrial development. There are limitless quantities of salt in the state. The best known deposits are the salt domes of the Gulf Coast region. They are intrusions from unknown depths that almost reach the surface in some instances. There are over 100 salt domes known to exist in Texas. This salt can either be mined by sinking a shaft into the salt mass, or by drilling wells into it and circulating water through the salt and producing the brine.

Vegetable Oils—The vegetable oils which Texas can and is producing are now receiving much interest throughout the nation. The stepped-up demand, coupled with the falling off of our imports has created a shortage of both edible and non-edible vegetable oils. The restrictions on the growing of cotton had already produced an apparent shortage of cottonseed oil, which left us with an insufficient supply on hand at the outset of hostilities. The reduced planting of cotton has incidentally produced a shortage of cotton linters, so important in the manufacture of nitro-cellulose or guncotton.

To offset the shortage of vegetable oil, the farmers have been asked to plant large acreages of peanuts for crushing purposes. The majority of the farmers are inherently cotton farmers; they have the tools to produce, gin, and bale the cotton. They will plant peanuts as the government has asked them; but will they have the tools to haryest and thrash them? It is the opinion of many in Texas that the increased planting of cotton would be a more satisfactory solution to the oil shortage that is before the nation.

Flaxseed—Numerous experiments have and are being carried on to determine which crops will best produce oils in the Texas climate. As far back as the fall of 1937 in the Taft Area, flaxseed were imported and planted on various test tracts. The results were so satisfactory that the planting spread year by year until at present it is generally being planted throughout the Southwest Coastal section.

The cotton seed crushers who had in no little way sponsored the intro-

duction of flax, were quick to see its possibilities, and several mills have been converted in order to crush flaxseed as well as cotton seed. Flax in Texas has assumed a position as a cash-winter crop and will help alleviate the acute shortage of drying oils in the paint and varnish industry.

TEXAS CAN SUPPLY PROCESS INDUSTRIES WITH THESE RAW MATERIALS

Resources	Used to Make
Anhydrite	Salt cake (under research)
Arsenopyrite	Arsenic for insecticides
Asbestos	Insulation
Asphalt rock	Floor tile and paving
Barite	Barium metal and drilling mud
Basalt	Insulation as rock wool
Bentonite	Drilling mud and filler
Bromine	Medicine, tetra-ethyl lead and others
Caliche	Insulation as rock wool
Candelilla plant	Wax like bees-wax
Castor bean	Insecticide, oil and fiber
Cattle	Fertilizer, casein, hides and glue
Celestite	Fire works, signal flares and drilling mud
Chromites	Chromium for plating
Cinnabar	Mercury, calomel, etc.
Citrus fruits	Citric acid and oils
Clay	China, pottery, bricks, enamel and alum
Coal	Fuel and coal products
Corn	Starch, oil and furfural
Cotton linters	Rayon, explosives and plastics
Dolomite	Glass, enameling and magnesium
Feldspar	Glass, glazing and enameling
Fish	Meal, hides and oil
Flax	Meal and oil
Fluorspar	Glass, steel making and source of fluorine
Forest products	Paper, wall board and paints
Fuller's earth	Bleaching and as a filler
Gilsonite	Mastic tile, etc.
Graphite	Dry lubricant and paint
Greensand	Water treatments
Gypsum	Plaster of Paris and plaster board
Helium	Diluting oxygen and air ships
Iodine	Medicine and chemical synthesis
Iron ore	Iron, pigments and drilling mud
Kaolin	Ceramics, paints and alum
Lead	Acid resisting linings and paints
Lignite	Fuel oil and bleaching medium
Limestone	Lime, dry ice and as a flux
Manganese ore	Steel alloys
Mica	Electrical insulation and as a parting powder
Mineral waters	Iodine, bromine, salt cake, etc.
Molybdenite	Steel alloys
Natural gas	Fuel, carbon black, hydrogen, synthetic chemicals
Naval stores	Paint and plastics
Oyster shell	Lime and dry ice
Peanuts	Plastics, oil, etc.
Petroleum	Plastics, asphalt, rubber, fuels and oils
Potash	Fertilizers and source of potassium
Rice	Starch, alcohol, furfural and oil
Rice Straw	Paper and paper board products
Salt	Chlorine, hydrogen and caustic soda
Salt cake	Paper making, etc.
Sand	Glass, sodium silicate, abrasives, ceramics
Sea water	Bromine, iodine and magnesium
Silver ore	Silver and silver salts
Sulphur	Sulphuric acid, sulphur dioxide, etc.
Sweet potatoes	Starch, syrup and stock food
Talc	Face powder, and treating rubber
Water power	Industrial power
Zinc	Zinc plated steel and chemical synthesis

Chemical engineering developments that may mean new industries for Texas

E. P. SCHOCH and ASSOCIATES *Bureau of Industrial Chemistry, University of Texas, Austin*

IN 1914, the Bureau of Industrial Chemistry was established. Since 1937, its funds have been increased, and it now functions primarily as a research institution.

The three subjects being studied are those which were deemed to be most urgently in need of research. They are:

(1) New manufacturing processes for transforming natural gas at the wells into needed industrial products.

(2) New processes for changing the spinning properties of Texas cottons so as to make them more generally usable.

(3) Developing new Texas nonmetallic minerals for fine ceramic wares.

In a larger way, these three divisions concern themselves with the following subjects respectively:

(1) Natural gas and petroleum;

(2) Products from the farm and ranch;

(3) Manufactures from non-metallic minerals.

It is believed that fundamentally new processes must be developed in order that the new industries to be established in Texas may add to the industrial life of the whole nation, —while the moving of industries from elsewhere to Texas or the establishing of competing industries might help Texas only at the cost of other regions.

NATURAL GAS PROBLEM

Texas furnishes nearly all the carbon black of the world—and for this purpose it burns daily about one billion cu.ft., with an average yield of 1.45 lb. per 1,000 cu. ft. feet. The price paid for much of this gas is about one-third cents per 1,000 cu.ft. Hence, this gas for carbon black may be said to be practically wasted. Other gas which is wasted outright raises the total daily gas waste to about one and one-half billion cu.ft.

Since 1929, there has been in progress in this bureau an investigation of the effect of electric discharges upon dry natural gas (methane)—and this project was made the exclusive work of this division since 1937. It is found that at atmospheric pressure acetylene is obtained from natural gas with quantities of electric energy equal to or somewhat less than that required for making the corresponding amount of calcium carbide. The operation can produce an end-gas varying in acetylene content from 5 percent to 20 percent. It also produces about one-fourth as much carbon black.

At present, this division is busy with the testing of a pilot plant operating the process. It is also working on the production of pure acetylene and the production of butadiene direct from the end-gas obtained.

An idea of the possible significance to Texas which this process may have can be obtained from the following:

If the gas now used for making carbon black is used in this process it will furnish enough acetylene to make twice the amount of rubber used in the United States during peace time, and leave enough residue gas to produce all the power needed for this process—and in addition produce 25 percent more carbon black than is now produced, and which is now the sole product obtained from this gas. Surely, such an economic result is worth striving for.

The cotton research program is to so modify the short staple cottons produced in Texas as to render them acceptable to the trade despite their staple lengths. We have, therefore, devoted our entire attention to the chemical modification of the surface of the cotton fiber, without destroying its fibrous properties, to the end of enhancing the property of frictional resistance.

Considerable success has been obtained with one treatment, and after cooperative experiments with cotton mills in various sections of the country a small pilot plant has been built for the production of the treated cotton and a complete cotton spinning and testing laboratory is being installed to develop the technology necessary to bring to a full fruition the newly developed property.

Several other projects being initiated are: (1) utilization of the cedar (*Juniperus mexicana*) covering hundreds of square miles of Texas in dense, readily accessible stands. Cedar is the source of cedar-wood oil, widely used in the drug and cosmetics industry, and it is a peculiar property of this species of *Juniperus* that the foliage contains an appreciable amount of camphor; (2) utilization of agricultural crops, either directly or as wastes, for the development of a fermentation industry. Texas is producing a tremendous quantity of fermentable crops, and could produce a much larger quantity, particularly of corn, sorghums, sweet potatoes, and wood waste; (3) development of a wool scouring industry in a state producing one-sixth of all the wool grown in the United States; (4) development of an essential oil and drug industry, utilizing crops either native to the state or readily cultivated, such as rose, gardenia, ephedrine, horsemint, wormwood, cassie, mint, sage, etc.

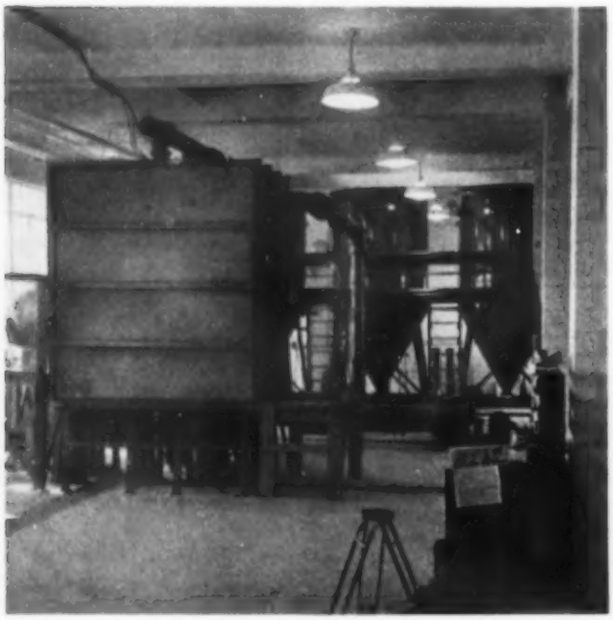
Research bearing on requirements of ceramic porcelain industries, dinnerware, hotel china, sanitary ware, electrical porcelain, and high-grade floor and wall tiles, has been carried on by the Bureau. First, adequate deposits of raw materials which such industries could use were located. The problem of proper processing of each deposit has been worked out, e.g., a feldspar of excellent whiteness and fusibility has been produced. Clays and related minerals have been given control treatments to produce plasticity without stickiness, strength with workability, and whiteness of extreme purity. In order to confirm results obtained in the laboratory, chinaware bodies composed of all Texas raw materials were submitted to representative manufacturers and made into ware by the regular factory processes. The results were highly successful.

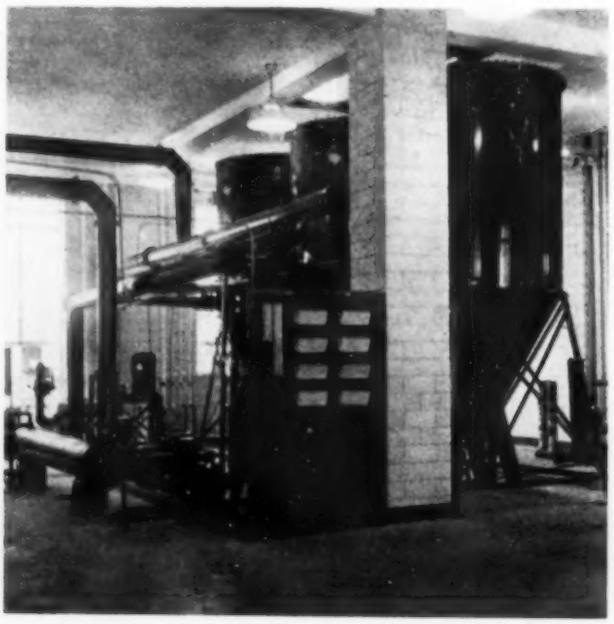
It can now be stated that not only are all of the standard raw materials traditionally used by these industries found to be available in Texas, but also halloysite and white firing montmorillonite. The latter is now attracting much scientific attention. Therefore, any porcelain industry wishing to locate in the Texas market area can now have not only the ideal cheap fuel but the advantage of superior raw materials close at hand. At the present time the cost of transportation of these wares from distant points forms such a large item of cost to the consumer, that the principles of national economy call for porcelain production in the state.

Recent research has brought to light clays of unusual properties maturing at the same temperature as that required by the artist's glaze colorings. The occurrence of volcanic ash in this area has imparted these unusual qualities to certain clays and offers the artware manufacturer raw materials not available to most of the larger manufacturing establishments located elsewhere.

Hence, it may be said that not only are the usual raw materials for ceramic manufacture available in the Texas area, but many deposits have unusual properties which research in this Bureau is placing at the disposal of the manufacturer.

At atmospheric pressure, acetylene is obtained from natural gas with electric energy equal to or somewhat less than that required for making the corresponding amount of calcium carbide. Pilot plant for the production of pure acetylene, and the production of butadiene from the end-gas obtained





Machinery, Materials and Products

CHEM & MET PROCESS EQUIPMENT NEWS

Asphalt Tile

DEVELOPMENT OF a new type of asphalt tile designed to prevent accumulation of static electricity has been announced by the Building Materials Division of the Armstrong Cork Co., Lancaster, Pa. The new material, which will be known as Armstrong's Conductive Asphalt Tile, provides a surface condition which results in less than 0.1 megohm resistance to static electricity under specific conditions. No open flames are required during installation or repair work. The material is especially suitable as a resilient flooring in arsenals, shell and bomb loading plants, powder plants, and in various other industries in which static electricity or open flames would present a safety hazard. Individual tile units can be quickly replaced if accidentally damaged, and since the tiles are laid on a fast-setting adhesive, the floor can be put into service immediately. The material is non-slip, non-dusting, non-sparking, moisture-resistant, odorless, and will withstand fast trucking. It is highly resistant to indentation. The asphalt tile is supplied in gauges of $\frac{1}{8}$ in., $\frac{5}{16}$ in., $\frac{1}{4}$ in. and $\frac{3}{8}$ in.

Extrusion Press

AN IMPROVED 125-ton extrusion press which permits simultaneous loading and extrusion, has been developed by the Watson-Stillman Co., Roselle, N. J. The first of these units, illustrated by an accompanying photograph, will extrude carbon mixtures, but the press is also suitable for extruding any plastic material. The press has two containers, mounted on a swinging arm. The operator starts the automatic extrusion cycle by push-button control, then devotes attention to loading the free container. The main ram is $12\frac{1}{2}$ in. in diameter and has a 12-in. stroke. Advance speed is 54 in. per minute, pressing speed is 6.4 in. per minute at 2,000 lb. per sq.in. and return speed is 150 in. per min. Power is from 2 Vickers pumps driven by a 5 hp. motor. The complete unit is 10 ft. high and requires 4 ft. by 3 ft. floor space.

Insulating Varnish

A RECENTLY developed new insulating varnish, designated as S-110, has been announced by the Sterling Varnish Co., 116 Ohio River Blvd., Haysville, Pa., for application to electrical apparatus that must operate at abnormally high temperatures. Tests have indicated that S-110 will stand operating temperatures at 250 deg. C. or higher. When baked at 175-200 deg. C., it dries all the way through the deepest winding and does not resoften when exposed to high operating temperatures. The dried film is mechanically strong, adhesive and flexible, and retains these characteristics under adverse heat conditions.

One machine was wound with glass-covered wire and insulated with glass and mica, after which it was treated with two coats of S-110. The machine was then run to destruction. Upon investigation, the insulation varnish was found to be in excellent condition and the stator showed no signs whatever of breakdown even though the rotor bars had loosened, due to the brazing having melted away at 700-800 deg. C. The insulation test on the stator was perfect and when a new rotor was put into the machine and fresh grease in the bearings, the motor started up without any trouble.

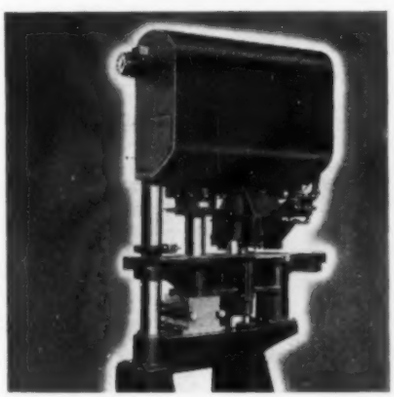
Hard Rubber

A SUPERIOR TYPE of hard rubber made from Ameripol, the synthetic rubber produced by this concern, is announced by the B. F. Goodrich Co., Akron, Ohio. The new synthetic hard rubber will stand temperatures 100 deg. F. higher than the best hard rubber made from natural crude before it will soften. It has been pointed out that the new development will extend the field of hard rubber, since it overcomes many of the limitations which had restricted the service of this type of rubber under extremely severe conditions. The accompanying illustration shows molded and extruded types of hard rubber made from the concern's Ameripol synthetic rubber.

Low-Temperature Heaters

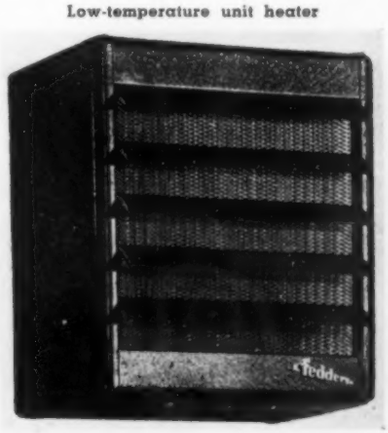
A NEW LINE of Series 4 "Lo-Temp" unit heaters is announced by the Air Conditioning Division of the Fedders Mfg. Co., Buffalo, N. Y. The units are designed to operate on steam pressures up to 150 lb., with emphasis on low final temperature, and are built in 12 capacities, ranging from 18,000-288,000 B.t.u. per hour, based on 2 lb. steam pressure at the unit and 60 deg. F. entering air temperature. Heating elements are designed to expand and contract freely within the cabinet and are anchored by telescoping mountings which maintain alignment and prevent stresses between elements and cabinets.

125-ton extrusion press



Hard rubber made from synthetic rubber

Low-temperature unit heater



Toxic dust respirator

Tubes of 3 to 1 ratio provide streamlined air flow over prime and secondary surface. Individual saddle fins allow each tube to give laterally, thus relieving differential expansion stresses between adjacent tubes. Fins saddled over the sides of tubes eliminate expansion stresses between fin and tube and between bonding points. One of the units is illustrated in an accompanying photograph.

Blueprint Letterer

A NEW TYPE of machine has been developed by the Ralph C. Coxhead Corp., 333 Sixth Ave., New York, N. Y., to speed the lettering of dimensions, bills of material, and notes on drawings and blueprints. The machine eliminates time-consuming hand-lettering of specifications, thereby saving valuable time for draftsmen. It is claimed that a hand-lettering job for specifications on a single sheet that formerly took 4 to 5 days of a draftsman's time is now done by a typist in half a day.

The new machine is an adaptation of the Vari-Typer, with changeable type faces and spaces. It uses a type font instead of letters and symbols on single type. Changing the type font permits use of a variety of styles and sizes of alphabets. The spacing arrangement is variable to permit use of alphabets with different width letters. The feature that makes the machine adaptable to sheets of great size is a basket-type carriage with open ends. The carriage and its supporting track have been extended to accommodate 20-ft. sheets. On the basis of a survey of 14 major companies producing war equipment, this concern has estimated that the new machine method of lettering drawings can effect a saving of 75 percent or more in draftsmen's time by elimination of hand-lettering. The machine is illustrated in an accompanying photograph.

Blueprint lettering machine

Respirator

A NEW RESPIRATOR for protection against toxic dusts has been announced by the American Optical Co., Southbridge, Mass. Representing a new design in toxic dust respirators, this new American R9100-T protector is light in weight and gives full vision, as shown in the accompanying illustration. The filter has been approved by the U. S. Bureau of Mines for protection against the inhalation of toxic or poisonous dusts such as lead, cadmium, arsenic, chromium, manganese, selenium, vanadium and their compounds. The facepiece with its leak-sealing cantilever edges of pliable rubber gives comfort to the face, while the simple, non-reversing exhalation valve provides protection. The double headband of solid rubber holds the respirator, which weighs only 1½ oz., in place without noticeable tension.

Industrial Humidifier

A NEW INDUSTRIAL humidifier just announced by the Carrier Corp., Syracuse, N. Y., provides low-cost humidification, yet is compact, easily installed and low in power consumption. The unit can be moved readily to accommodate equipment layout changes, and is suitable for use in single or in multiple. Available in two capacities, the two sizes will provide 4,800 or 6,150 cu. ft. of humidified air per minute, and evaporate up to 96 lb. of water per hour. The unit, built in two sections to facilitate handling and designated as the Carrier Type 43G, includes fan and motor, humidifier pack, heating coil, drip pan, dampers, lint catcher, and housing.

Condensate Sampler

A CONDENSATE sampler for electrical-conductivity check-up of steam or other condensate has been announced by Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J. The device operates in conjunction with a suitable electrical instrument calibrated in direct-reading terms such as percentage of carry-over of soluble salts. The cell holder admits the condensate into the chamber provided with a baffle and a two-way drain cock. At the bottom of the chamber is the conductivity cell. The thermometer indicates the temperature of the condensate, and a sight gage shows the presence of oil which can be drained off by turning the drain cock to the oil-drainage position, thereby safeguarding the conductivity cell against contamination. The cell holder is available alone for use with any type of condensate cooler or in combination with a new type of condensate cooler now available. The cell holder admits the condensate through its ¼-in. solderless pressure-connected copper pipe. An outlet pipe with a two-way control cock releases the condensate to the drain pipe. A neoprene baffle within the sampler chamber insures the proper circulation of the condensate past the conductivity cell screwed in at the bottom of the chamber.

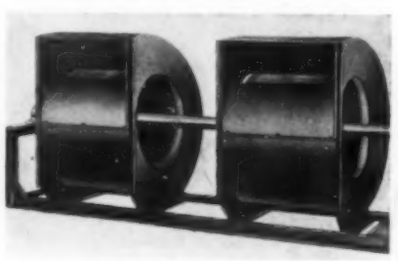
Plastic Insulation

FOR THE cold insulation of pipes, walls, ceilings, tanks and other equipment, to prevent condensation and sweating, J. W. Mortell Co., Kankakee, Ill., has announced No-Drip, an improved plastic cork coating which does not require power spray equipment for its application. It may be applied with an ordinary paint brush, a trowel or a spray. This material is spread ¼ in. thick over metal, concrete, brick, plaster, tile, wood, composition or metal surfaces, and can be painted any color. It is said to act not only as an insulation, but as a protective coating for preventing rust.

Blower Units

PRODUCTION OF new motor blower units in a wide range of sizes is announced by the Niagara Blower Co., 6 E. 45th St., New York, N. Y. These are available in 16 models and are produced in 1, 2 and 3-fan assemblies to meet resistance up to 4 in. s.p. and in capacity from 880 to 42,600 cu.ft. per min. Fan speeds range from 300 to 1,750 r.p.m. The blowers may be secured with or without casings. They are belt-driven or direct-connected and are especially designed for simplified application to duct systems. Units are available in two series of fan designs. Series 1100 gives large volumes of air with quiet operation at low fan speeds for static pressures up to 1½ in. Series 1200 meets the resistance of duct systems and special conditioning equipment, protecting motors from overload by a retarded horsepower curve, for static pressures up to 4 in.

Two-fan, belt driven blower



Equipment Briefs

A NEW MODEL of Mineralight ultraviolet ray black-light lamp, useful for identifying tungsten ores and other minerals which fluoresce under black light, is announced by Ultra-Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles, Calif. The new model operates with a cell in a built-in compartment and features a built-in regular flashlight in addition to the black light lamp. A double contact switch enables the operator to use either type of light, thus permitting him to look for likely indications with a regular light and to check at once with the black light. The unit weighs 7½ lb., including 2 six-volt lantern batteries. Small batteries will operate the lamp for 15-20 hours, which has an ultra-violet efficiency high enough to detect the mineral Scheelite as far away as 10 ft.

IN ORDER TO provide a method of indicating air raids and necessity for blackouts, the "Reco" motor-driven coding control has been developed by the Reynolds Electric Co., 2650 W. Congress St., Chicago, Ill. As its action is automatic, the danger of carelessness and error with manually operated sirens and alarms is avoided. The unit has two signals: one which gives a series of alarms in 15 cycles of raising and lowering tones during the period of two minutes, and the other which signals a steady "all clear" siren blast for two minutes. This control is supplied with automatic cut-off and push-button start, for 110 volts, 60 cycle current and can be furnished in weatherproof cabinets.

A NEW APPLICATION for its electrically conductive rubber and synthetic rubber compounds, in the form of a new sandblast hose, has been announced by the B. F. Goodrich Co., Akron, Ohio. The new hose replaces the company's previous anti-static sandblast hose which used an internal wire construction for dissipating static charges. The new hose contains no wire, the rubber compound itself carrying away the static electricity as fast as it forms. The company has also announced that its Type 400SS oil hose is now made entirely without natural rubber, its own synthetic rubber, Ameripol, being used.

PHOTOVOLT CORP., 95 Madison Ave., New York, N. Y., has announced the new Lumetron Model 400 portable photoelectric colorimeter which features portability, simplicity of operation and low price. The meter operates from any 110-volt outlet and is claimed to be exceedingly simple to use. Although in the price range of visual colorimeters, the new model offers the various advantages of photoelectric instruments, such as independence from the personal equation.

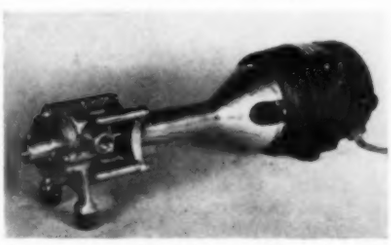
KNOWN as the Verd-A-Ray lamp, a new incandescent lamp said to reduce eye strain and fatigue and thus to conserve the body's vitamin A has been introduced by Save Electric Corp., Toledo, Ohio. The new bulb gives off less of the red and more of the green-yellow rays, casting a pastel green hue on white substances and making them glare-free, according to the manufacturer. The effect is said to be about the same as that of ordinary light or the so-called "eye-ease" green paper. The bulb is coated with a ceramic glass-on-glass filter, is said to consume the same amount of current as standard lamps of equal wattage, and is available in sizes from 40 to 1,500 watts.

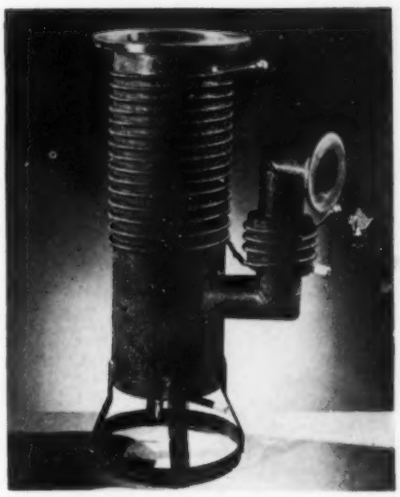
TO CONSERVE NICKEL for the war effort, the American Manganese Steel Division of the American Brake Shoe & Foundry Co., Chicago Heights, Ill., has made available a new manganese steel welding rod known as "V-Mang." An alloy steel containing 12-14 percent manganese, molybdenum and other elements, this electrode will replace Amsco Nickel-Manganese steel electrodes, except in a few exceptional cases. Tests have shown that the new rod can be applied readily and that it has ductility and tensile strength equal to or better than nickel-manganese steel rod as applied. It can be used to repair fractures in manganese steel parts as well as for built-up work, depositing a uniform bead similar to that from nickel-manganese electrodes. It is available bare and coated in $\frac{1}{8}$-in., $\frac{5}{32}$-in., $\frac{3}{16}$-in. and $\frac{1}{4}$-in. diameters and in 18-in. lengths. Standard containers, waterproof wooden boxes, contain 50 lb. of rods.

Midget Hot Liquid Pump

THE EASTERN Engineering Co., 45 Fox Street, New Haven, Conn., announces a newly designed midget hot liquid pump known as the Model EH, illustrated in an accompanying photograph. The design of the pump makes it suitable for handling hot liquids up to 500 deg. F. The unit is of the centrifugal type, weighs 7 lb., and is 12 in. long by 4 in. wide by 4½ in. high. The motor is of the 1/20 hp. universal fan-cooled type for use on 115 volts, a.c. or d.c. Both motor and pump are coupled through a 5-in. heat radiating tube and the shaft is supported by outboard ball bearings. The pump will deliver a maximum pressure of

Hot liquid midget pump





High capacity metal vacuum pump

21 lb. per sq.in. and a maximum volume of 7½ gal. per min. Materials of construction include stainless steel, Monel metal, chromium-plated bronze, Hastelloy "C" and other alloys.

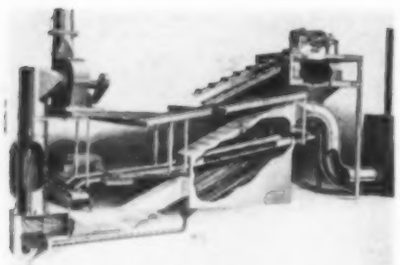
Booster Pump

A NEW HIGH-CAPACITY metal vacuum pump, known as the Metal Booster Pump, Type MB-200, designed for use with forepumps having low volumetric efficiency at pressures below 1 mm. of Hg, has just been announced by Distillation Products, Inc., Rochester, N. Y. This 2-stage oil diffusion unit will boost the pumping speed to 200 L. per sec. and will carry the vacuum from 0.5 mm. to 5×10^{-3} mm. of Hg. The unit has a vertical casing 6x20 in. and is readily connected to large mechanical pumps by 1½ in. standard pipe fittings, or in the optional model, as shown in an accompanying illustration, by a 2-in. i.d., 4 in. o.d. flange.

Incandescent Luminaire

ADAPTED FOR extreme service locations, such as steel mills, foundries, chemical plants or wherever acid fumes, dust, smoke or excessive moisture is

Incandescent Millite luminaire



Unit for drying sized coal

present, a new vapor-tight Millite luminaire for incandescent or mercury lamps has been announced by the Westinghouse Lighting Division, Edgewater Park, Cleveland, Ohio. Because of its weatherproof construction, the unit can be used for outdoor applications. Consisting of three parts, a porcelain enameled steel reflector available in several sizes, a socket assembly, and a hinged glass cover, the unit is arranged for conduit mounting. Reflectors for 300 and 500-watt sizes are made from 19 gage iron sheet, and the 400,750, and 1,000-watt sizes are from 18 gage.

Vapor-tight sealing is obtained with a heavy, treated asbestos gasket between cover and housing. An impact-resisting glass lens 0.25 in. thick is designed to withstand sharp temperature changes and if broken, shatters to small dull fragments rather than splitting into large pieces. The unit is shown in an accompanying illustration.

Coordinator Device

A NEW COORDINATOR device, called the "Produc-Trol" and illustrated by the accompanying photograph, has been developed by Wassell Organization, Westport, Conn. Use of this device enables executives to see all facts concerning raw materials, parts, assemblies, machines and man hours. It is especially useful where multiple-shift production is maintained. The unit lists parts, assemblies, sub-assemblies, or individual operations on a part, at the left of the board. Movable tapes working from left to right on pulleys bring all pertinent facts into focus. Double rows of peg holes under the movable tapes and various colored pegs permit various arrangements of comparative data and control required for any operation.

Coordinator device and board

Units can be ordered in sizes to fit specific needs. Models are also available for individual and group incentive plans.

Coal Dryer

A NEW DRYER for the effective removal of surface moisture from sized coal has been tried out on actual installations and is now announced by the Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill. The dryer, to be known as the Link-Belt "SS" dryer, combines mechanical dehydration with heat drying and is available for drying sized coal of 10 mesh and up. The unit comprises a drying chamber with perforated reciprocating-plate drying surface; coal inlet and outlet; hot air inlet from a coal-fired furnace; and an exhaust fan for drawing the hot air into the chamber, over and through the bed of coal, down through perforations and reciprocating plates to the exhaust stack. Operation of the moving element is analagous to that of the shaker screen except that the perforations are small and are intended only for passage of drying air. Inasmuch as the coal passes through the dryer in a thin bed at slow speed, it is uniformly dried with low temperature air and discharged relatively cool. Comparatively little power is required for operation of exhaust fan and reciprocating plate. The unit is illustrated by an accompanying figure.

Load-Center Unit Substation

NEW STANDARDIZED load-center unit substations are now available in sizes ranging from 100 to 2,000 kva., according to the Allis-Chalmers Mfg. Co., Milwaukee, Wis. These compact units can be installed anywhere in industrial plants or power distribution centers, saving valuable headroom, floor space and long secondary runs of heavy copper.

Extremely flexible, the standard unit substations offer a wide source of incoming- and outgoing-line arrangements. The substation consists of a metal-enclosed incoming-line section, a throat-connected transformer and a low-voltage heater section. On the high voltage side, potheads, disconnect switches, oil fuse cutouts, metal-clad switchgear or direct connection through terminal box can be supplied. On the low voltage side, stationary or draw-out air breakers, electrically or manually operated, are furnished. Transformers can be oil-immersed, dry type or non-inflammable liquid filled.

Rotary Pump

A NEW VERTICALLY mounted rotary pump has just been put into production at the plant of the Blackmer Pump Co., in Grand Rapids, Mich. This unit has a capacity of 150 g.p.m. at a pressure of 100 lb. per sq.in. and is powered by a 15 hp. gearhead motor, 300 r.p.m. on the pump shaft. The same type of pump and mounting is also furnished in capacities from 5–700 g.p.m. and in pressures up to 300 lb. per sq.in. This pump can handle a wide range of liquids. The pump is self-adjusting for wear, and there is practically no loss of volumetric efficiency during the life of the swinging vanes. When the buckets are worn out, the unit can soon be restored to its original efficiency.

Abraser Vacuum Pick-Up

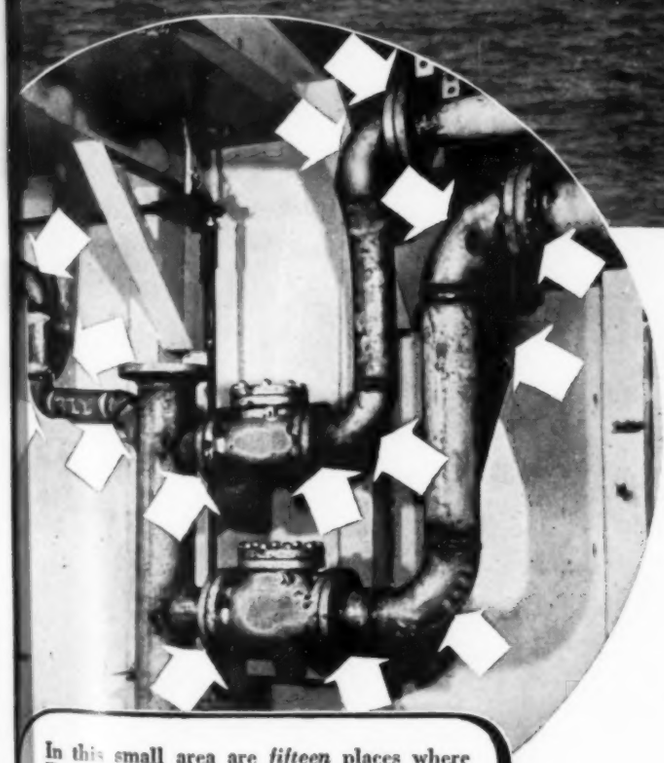
THE TABER Instrument Corp., North Tonawanda, N. Y., has announced its improved Abraser Vacuum Pick-Up, Model HV-42, as accessory to the Taber Abraser method for measuring resistance to abrasion of surface finishes. The function of the vacuum pick-up is to prevent accumulation of abradings from interfering with the normal wear action of the Calibrase wheels. The unit has a nozzle mounted on the suction end of the housing so as to swing in and out of position. The nozzle-holder can also be adjusted vertically to the proper height above the specimen. The contaminated air is drawn through the nozzle and connecting tube into the high-speed centrifugal pump, then through a special filter bag, which can be quickly and conveniently removed for cleaning. The motor is the high-speed universal type designed for operation on any electrical circuit of 110-120 volts.

Panel Mounting

THE LITTLEFUSE indicator, or Panel Mounting No. 1414, which instantly reports a break in circuit by flashing on a light only when the circuit is broken, has been announced by Littelfuse Inc., 4757 Ravenswood Ave., Chicago, Ill. When installed at any convenient or desirable point in connection with remote motor control, it works instantly with a plainly visible signal to show "on" or "off." When the circuit breaker opens the light goes on. The unit can be had for 24 or 48 volt filament bulbs with which no resistor is used. Otherwise it uses a built-in, 200,000 ohm. protective resistor, in series with a neon lamp. The resistor prevents the lamp from blowing out on unexpected high voltages. The lamp glows on current as low as 100 microamperes. The indicator has a black Bakelite body and is made for panels up to $\frac{5}{16}$ in. thick and $\frac{1}{2}$ in. diameter mounting hole. Overall length is 2 in. below panel, $\frac{7}{8}$ in. above panel. The rating is 90 to 250 volts.

Panel mounting

There are no "spills" at piping turns when TUBE-TURN fittings are on the job!



In this small area are *fifteen* places where Tube-Turn welding fittings and flanges are on the job—giving full protection against leakage and other maintenance worries. In any complete piping system, figure the hundreds of points where flow direction changes, and you'll see why Tube-Turn returns, elbows, tees, reducers, laterals, nipples, caps and flanges offer extra protection and trouble-free piping.

Disaster at the turns is an old story—

With spray flying and motors roaring, speed boats hurtle around the buoy-marked racing turns at break-neck speed! Cutting the curves too sharp or too fast means an upset—another case of failure at the turns.

The same danger lies at turns in *piping systems.* Wherever there is a change in flow direction, the strain imposed by the flow speed and pressure increases the probability of leakage and failure unless they're *welded* and *protected* with Tube-Turn welding fittings!

Write for helpful Tube-Turn data book and catalog.

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Beet Sugar Production

SUGAR BEETS are grown in the district between Michigan and California and produce substantially 25 percent of the sugar (sucrose) normally consumed in the United States. Of the eighty-odd American beet processing factories, that of the Amalgamated Sugar Co., at Nyssa, Ore., is one of the most modern.

For processing, the beets are washed and "sliced" into long, narrow, thin v-shaped "cossettes". These are fed to a battery of vessels wherein the sugar and other soluble constituents are extracted by diffusion in a countercurrent manner. The resulting solution is treated, in first carbonation, with milk of lime (or saccharate milk from the Steffen House) and carbon dioxide to precipitate impurities. The precipitate is separated from the purified solution by thickening and filtration and the clear solution is further treated with carbon dioxide to precipitate residual lime, and again the precipitate is separated from the solution by filtration. The resulting filtrate is concentrated in a quintuple effect evaporator to a point just short of saturation. The resulting solution is further concentrated in the "white" vacuum pan to produce sucrose crystals, and the resulting "massecuite" is separated in centrifuges to produce refined sugar and "green syrup." The refined sugar is then dried by passing through a rotary dryer and is, in the more modern factories, stored in bulk to be packaged for shipment as desired. The green syrup is further concentrated in vacuum pans to yield impure sugar crystals which are returned to the system for reworking.

Sugar is recovered from the molasses by adding pulverized quick lime to a dilute solution thereof (the Steffen Process) at temperatures below 20 deg. C. The resulting precipitate, tricalcium saccharate, is separated by filtration and the filtrate is heated to produce a second sugar-containing precipitate which is separated by thickening and filtration. The two precipitates are mixed to form saccharate milk which is used in first carbonation.

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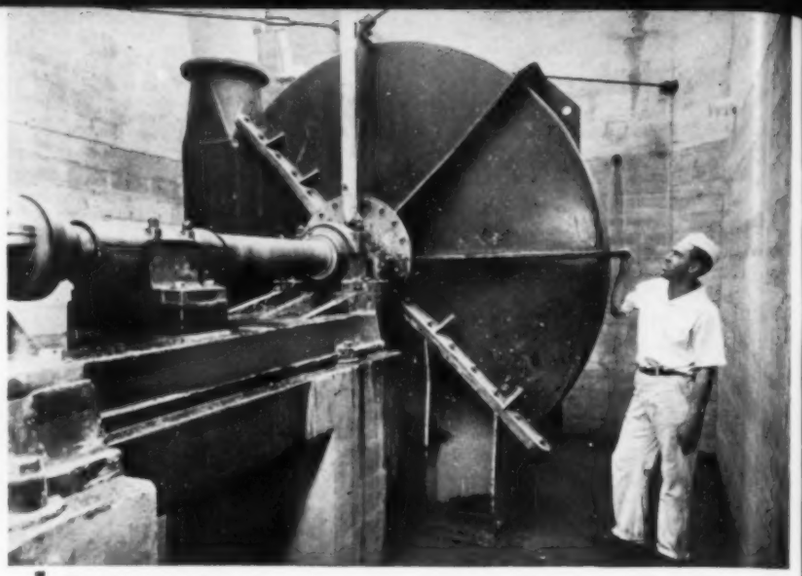
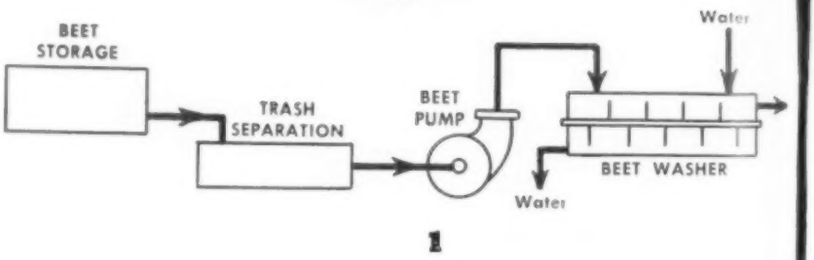


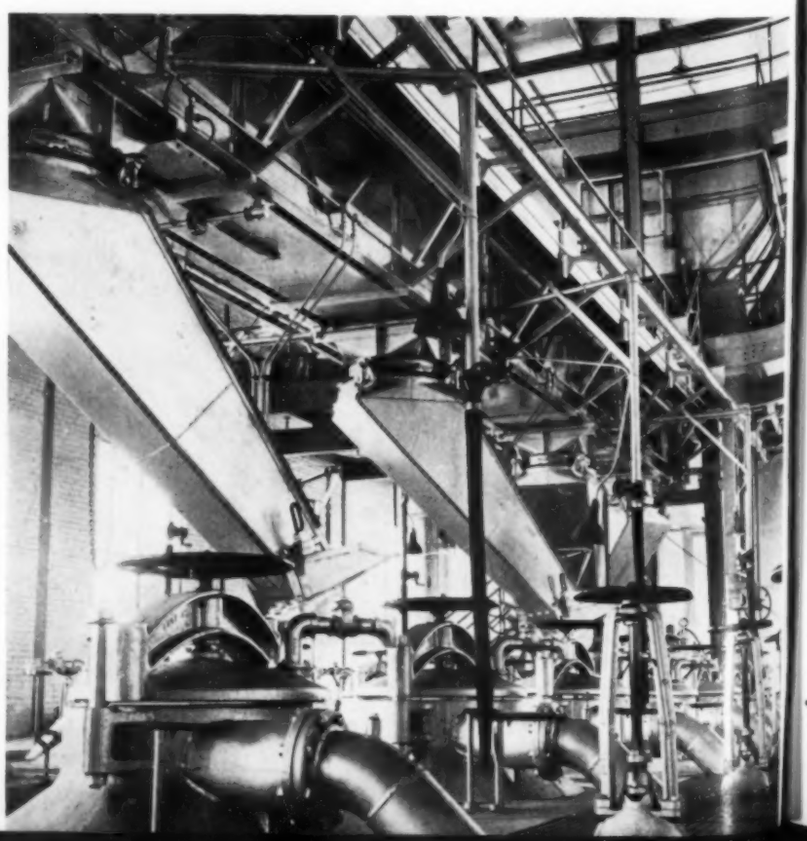
1 Centrifugal beet pump designed to transfer the whole beets from the unloading yard into the mill. Flume water and beets are lifted over 9 ft.

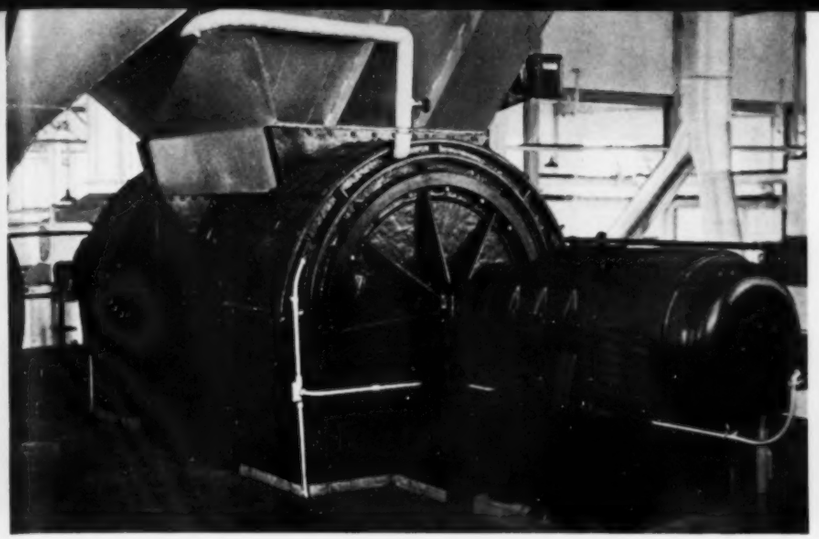
A *Chem & Met* FLOW SHEET



1

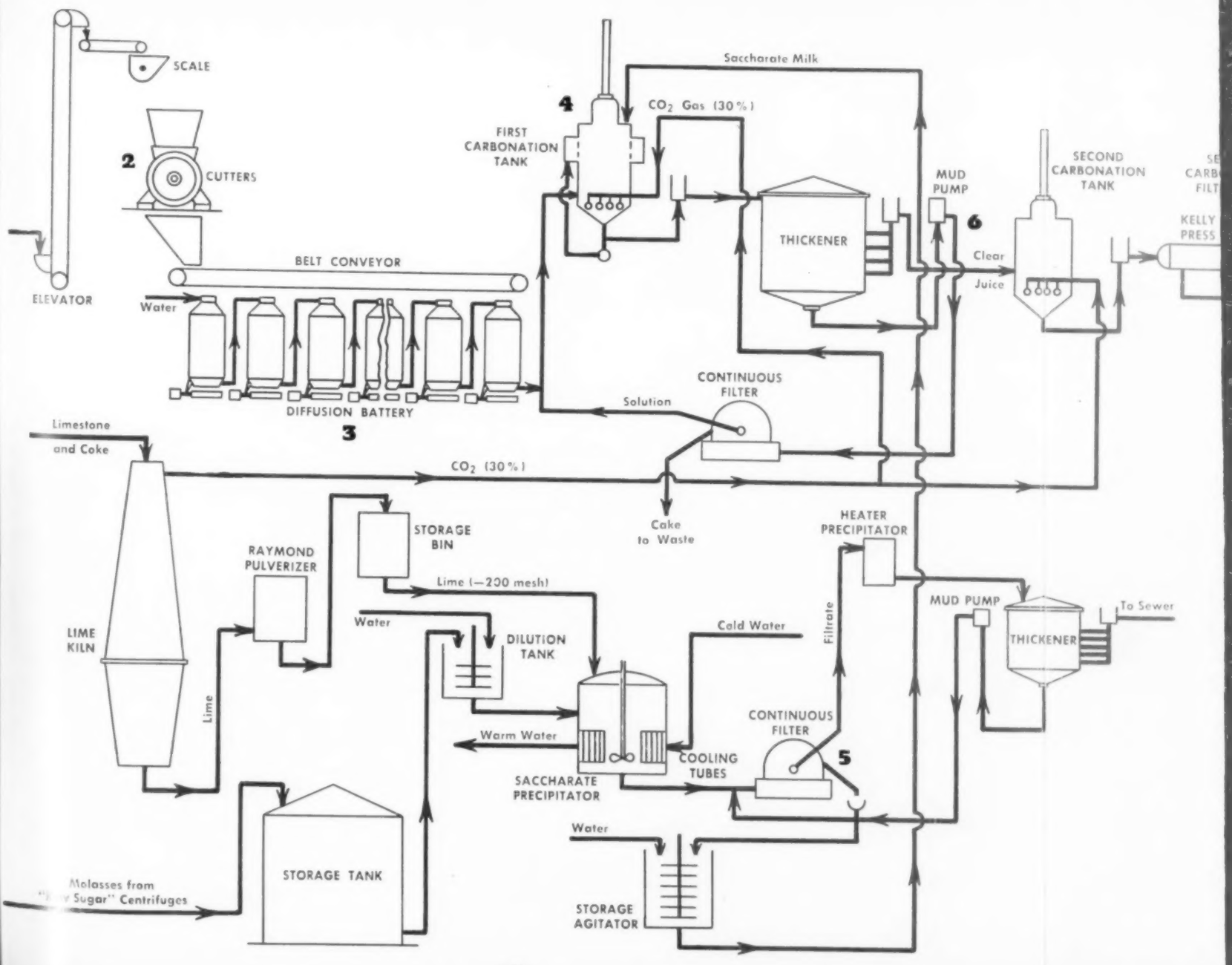
3 The cossettes are fed by conveyor to a battery of diffusion vessels where the sugar is extracted by counter current principle



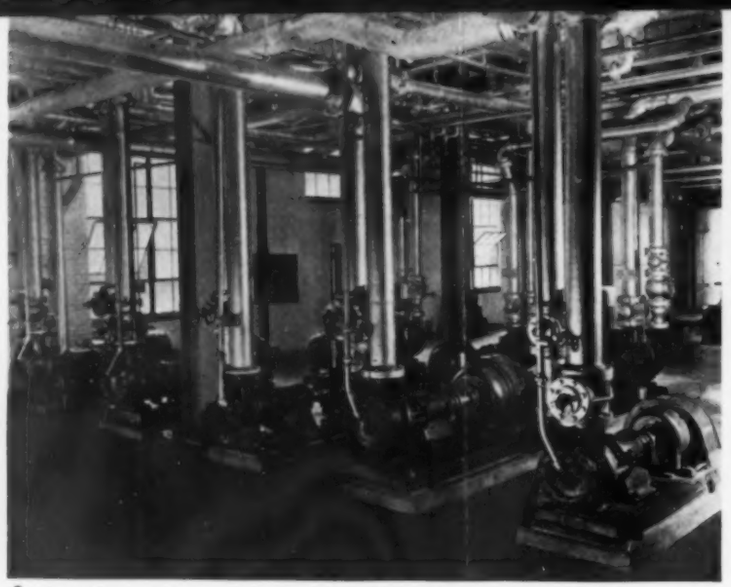


2 Beets are next washed to remove all dirt and trash, elevated to scales, dumped into cutters which reduce them to V-shaped slices known as "cossettes"

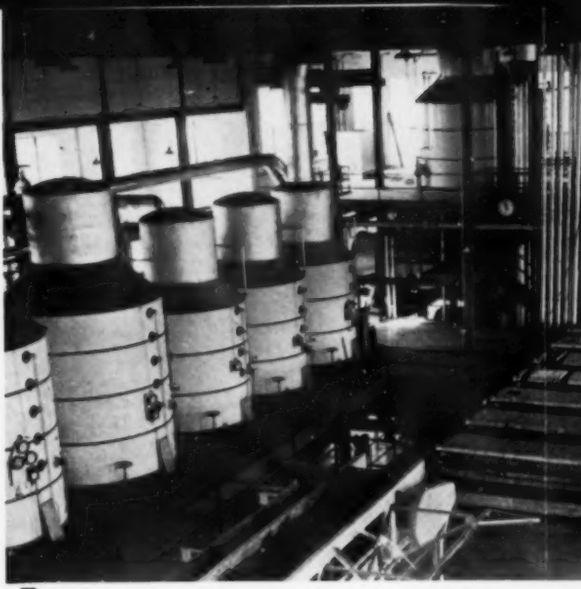
4 Sulphonation tower, and first and second carbonation tanks are shown. Sucrose solution is treated in the first tank with CO_2 and saccharate milk



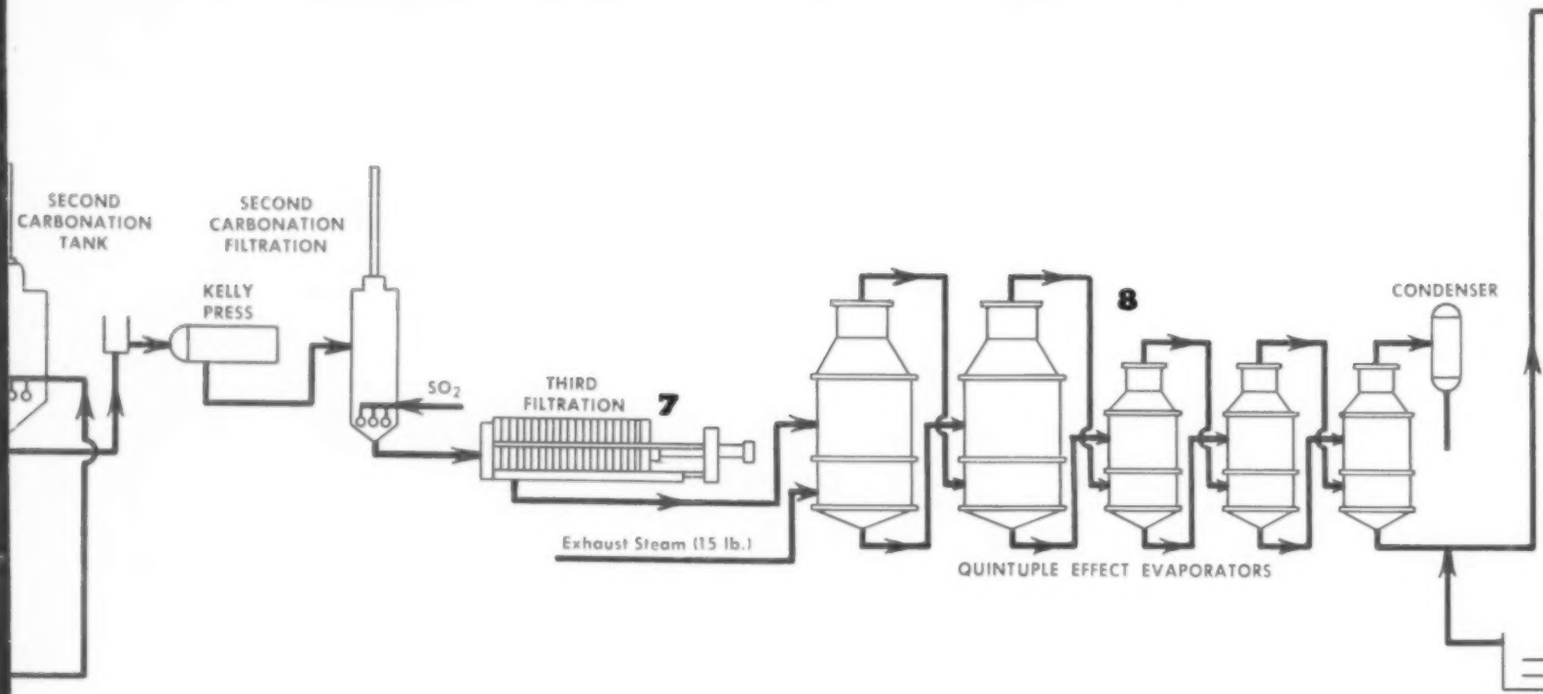
tanks are shown.
ccharate milk



6 Centrifugal juice pumps are of unique design in that they have what is known as an air or non-condensible gas removing fixture

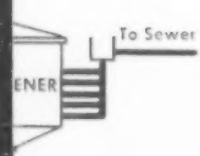


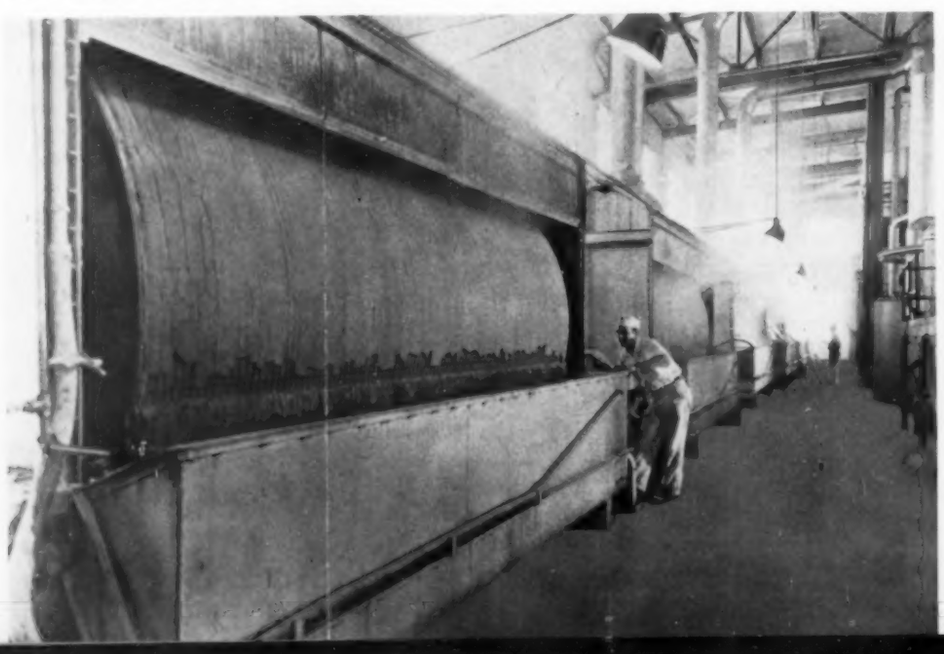
7 General view showing evaporators (left), vacuum pa
cossette conveyor (foreground), and one of the crystallizers

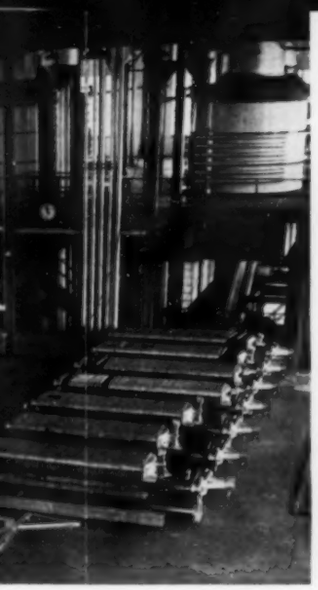


5 Impurities after the first carbonation treatment are removed on a continuous drum filter. The mud goes to waste and the filtrate returns to the first carbonation tank

9 Following the gra
the filmass passes t

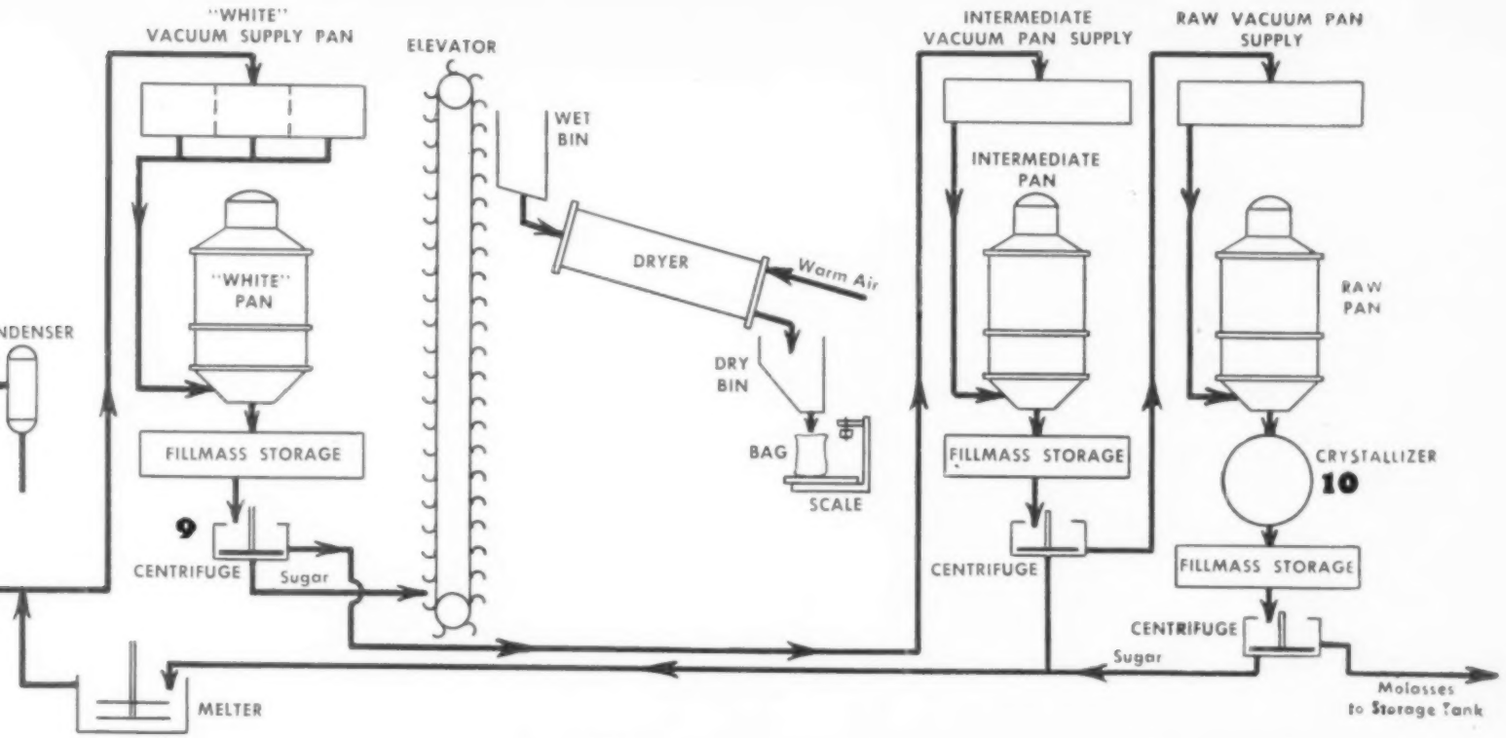






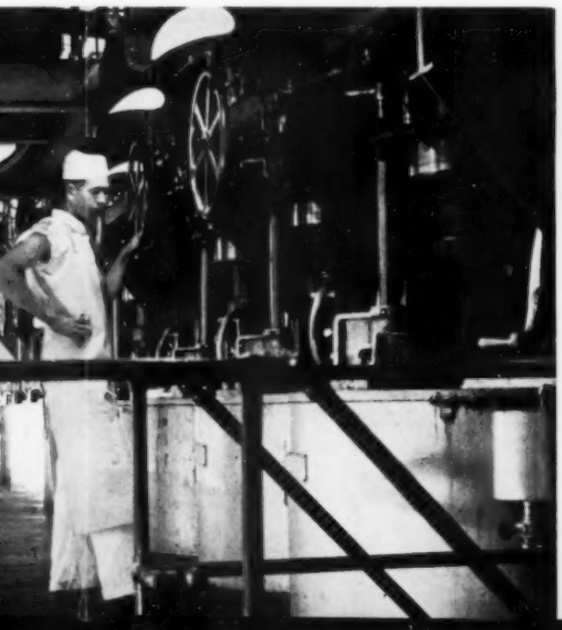
vacuum pans (rear), part of crystallizers (left rear)

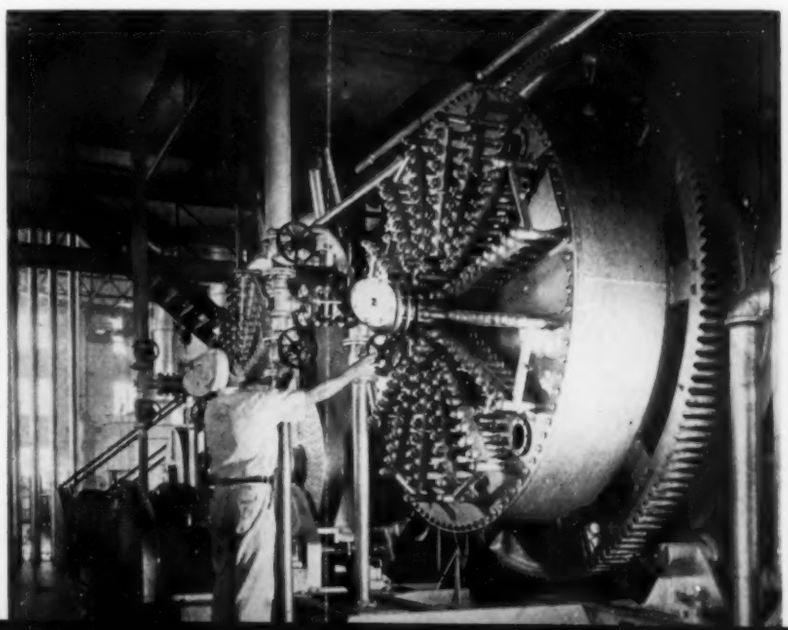
8 After the final purification the sugar solution is pumped to the juice boilers and then to the quintuple-effect evaporators. Concentration is followed by graining



wing the graining operation in the "white" vacuum pan. ss passes to centrifugals where crystals are separated

10 Following a single calandria raw pan are two Lafeuille crystallizers. The recovered sugar goes to a melter and then returns to the white pan





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OPEN—BUT NOT ENOUGH! Quick wearing of valve seats and pressure drop are often due to valves that can't be fully opened. Rising-stem valves must have plenty of clearance, or non-rising-stem patterns should be used instead.

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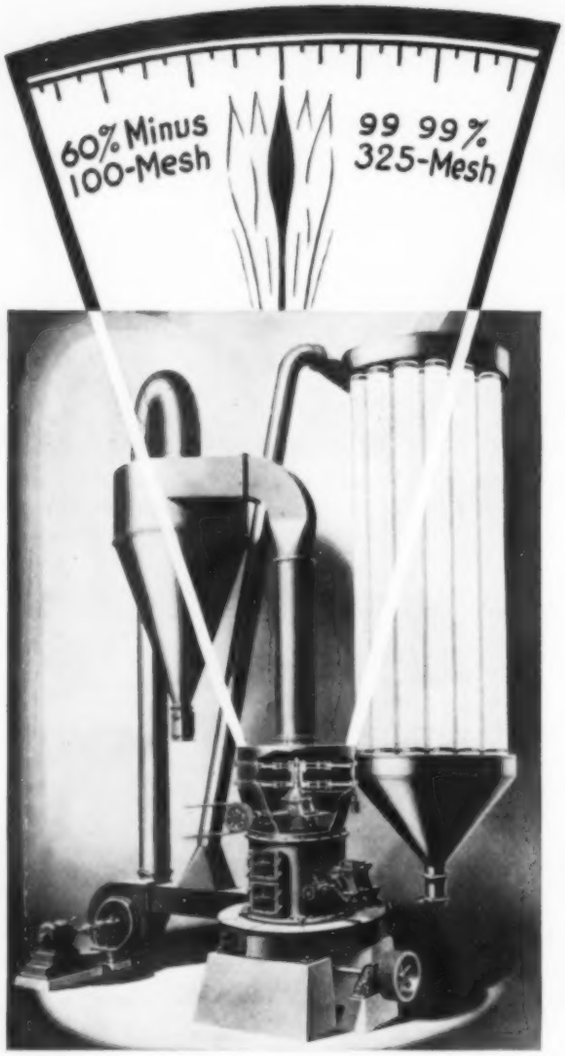
NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS



WIDE RANGE FINENESS CONTROL

with....

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Double Whizzer Type ROLLER MILL

DIVERSIFIED GRINDING . . .

Typical Roller Mill Applications

Pigments	Chemicals
Resins	Plastics
Fullers Earth	Iron Oxides
Carbon Mixtures	Cocoa Cake
Clays	Talc
Bentonite	Caustic Lime

Miscellaneous Non-metallic Minerals

There are many other materials which can be ground economically with the Raymond Whizzer-Type Roller Mill . . . If you have any special problems, let Raymond engineers recommend the right equipment for your purpose.

When pulverizing different products or making various grades of the same product, this versatile grinding mill permits quick changes in degree of classification . . . and when once set for a given fineness, it will maintain a constant uniformity of finished material.

A typical installation, producing insecticides and other chemicals, illustrates the flexibility of this system. The mill is provided with a separate fan for inducing CO_2 gas into the system when grinding sulphur. This fan is kept inoperative when handling bauxite and other materials. Desired fineness for each product can be obtained simply by changing the speed of the whizzer by the variable control unit.

The mill may be equipped with a throwout attachment for rejecting impurities automatically, thus refining the product where high purity is required. Materials with some surface moisture may be dried and pulverized in one operation by introducing heated air into the mill.

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CHEM & MET NEWS

DERBY HEADS MANUFACTURING CHEMISTS' ASSOCIATION

Harry L. Derby, president of the American Cyanamid & Chemical Corp. and for many years chairman of the executive committee of the Manufacturing Chemists' Association was elected president of the Association at the seventieth annual meeting held in New York, June 4. He succeeds Lamont du Pont who now becomes chairman of the executive committee. The only other change among the officers was the election of Howard I. Young, president of American Zinc, Lead & Smelting Co. to succeed William B. Bell of the American Cyanamid & Chemical Corp.

Following an off-the-record discussion of war problems of the chemical industry, led by Messrs. Reid, Morgan, Whitman, Coith, and Weidlein of the Chemicals Branch of WPB, the meeting witnessed a remarkable color, sound, and motion picture entitled "Combat". It depicts man's fight against insects and plant diseases and was shown through the courtesy of the General Chemical Co.

Speakers at the annual union dinner of the Association and the Synthetic Organic Chemical Association was Dr. Neil Carothers, dean of the College of Business Administration of Lehigh University. The program was arranged by a committee consisting of George W. Merck, chairman, Charles S. Munson and H. O. C. Ingraham.

UNITED STATES RUBBER HAS NEW RECLAIMING METHOD

United States Rubber Co. has announced a method of reclaiming used rubber which improves the quality of the reclaim, saves materials, and reduces the processing time so drastically that it increases the capacity of certain existing equipment by sixty percent.

By this method the processing cycle is reduced from 16 to 9½ hours. And at the same time the quality of the finished reclaim is improved because of a change and a reduction in the chemicals used in the process, according to W. G. Kirby, manager of reclaim development of Naugatuck Chemical Division, which operates the reclaim plant for the rubber company.

The announcement states that in reclaiming used rubber it is necessary to remove or dissolve any fabrics which the used rubber may contain. Also the scrap is treated to soften or plasticize the rubber and convert it to a physical state similar to unvulcanized rubber. "According to former processes, a digester was charged with scrap rubber, caustic soda, pine tar oils and water", stated Mr. Kirby. The mass was heated by steam under pressure and agitated for sixteen or more hours. With the new method, air is introduced into the chamber with the scrap, the steam pressure is increased to raise the temperature, the amount of pine tar oils is reduced, and the mixture is agitated for a much shorter time. The result is an improved quality of reclaim with a reduction of processing time and a saving in materials.

ENGINEERING SOCIETIES HOLD CONFERENCES WITH W.P.B.

At the request of the War Production Board, American engineering societies will hold a series of war production conferences to exchange information which may be helpful in solving manufacturing problems in war plants. The first conference was held in Dayton, Ohio, on May 8 followed by one held at Newark, N. J., on May 29.

Other conferences, sponsored by local engineering groups, will be held in other sections of the country during the next few weeks. Each conference will be arranged to fit the particular needs of the area in which it is held and the discussion leaders will come from war plants in that section.

Plans for this series were made after Donald M. Nelson, chairman of the War Production Board and William H. Harrison, Director of Production, met with the heads of six important national engineering societies. These included: David C. Price, American Institute of Electrical Engineers; James W. Parker, American Society of Mechanical Engineers; Frederick H. Fowler, American Society of Mechanical Engineers; Eugene McAuliffe, American Institute of Mining and Metallurgical Engineers; S. D. Kirkpatrick, American Institute of Chemical Engineers; and A. T. Colwell, Society of Automotive Engineers. Messrs. Parker and Colwell were designated to head a steering committee to arrange for local conferences.

Purposes of the conferences as decided by the War Production Board and the engineering groups is "to exchange, examine and disseminate information and experience on the engineering and management aspects of war production problems, and the change-over of plants and equipment to war production."

Invitations to conferences will be sent out by local engineering groups. Plant foremen, superintendents and engineers will be asked to bring their shop problems to round-table discussions.

FIELD CONSULTANTS WILL AID ARMY QUARTERMASTER CORPS

Fifty-four authorities in special fields have been named field consultants of the new Advisory Board to the Resources Division of the Office of the Army Quartermaster General, to assist in the program of product design and production, the War Department announced on May 28.

These experts will advise on problems of clothing, feeding and transporting the Army by motor, with emphasis on equipment for special troops, synthetics, textiles, subsistence, coal, leather, rubber, packaging, transportation and warehousing, woods, and metals.

Among consultants, classified according to specialty, are: Synthetics: Dr. Willard H. Dow, president of Dow Chemical Co.; Dr. M. G. Millikan, vice-president of Hercules Powder Co.; Dr. Elmer K. Bolton, chemical director, E. I. du Pont de Nemours & Co.; R. M. Banks, vice-president, American Cyanamide & Chemical Co.; John DeBell, Mellon Institute; Dr. George O. Curme, Jr., vice-president, Carbide & Carbon Chemicals Corp.; Dr. Ernest W. Reed, War Production Board; J. W. Livingston, vice-president, Monsanto Chemical Co.; Spencer Palmer, vice-president, Cellulose Products Division Tennessee Eastman Co.; Stanley Lovell, president, Beckwith Mfg. Co.; S. C. Woodruff, vice-president, Merck & Co.

The Advisory Board will not necessarily meet as a unit, but will individually be kept informed of Quartermaster Corps' activities, and will be asked for advice on all problems arising in their particular fields. The Advisory Board will cooperate through the Resources Division with those industrial experts and specialists already in service in the Quartermaster Corps.

CHEMICAL PLANTS GET HIGHER MAINTENANCE RATING

Amendment No. 1 to the Chemical Industry's repair and maintenance order P-89 follows the trend recently noted in WPB policy of making higher ratings available to keep vital war industries going at top speed. An A-1-c rating may be used to obtain 30 per cent of a chemical producer's regular operating supplies with an A-3 rating available for the remaining 70 per cent under the terms of the amended order. The original order granted an A-3 rating for all such supplies. The A-1-a rating used to obtain supplies to repair an actual breakdown and the A-1-c rating for repairs to avert an immediate threatened breakdown are held over from the original order.

Further recognition of the importance of having necessary repairs immediately available is the permission given suppliers to extend the A-1-c rating to replenish their stocks. As in the original order, neither producers nor suppliers may use the ratings unless they have obtained a serial number from the Chemicals Branch.

News from Washington

WASHINGTON NEWS BUREAU, McGRAW-HILL PUBLISHING CO.

MANPOWER problems will be the next big job for attention by executives and engineers of process industry. In some ways the plans of War Manpower Commission will help because war industry will get preference in new employees and protection for old ones. But the definitions for essential industry were still to be made at the first of June. And without the definitions, it is very difficult to say whether a particular division of business is going to be raided or protected.

Individual plants or industries must be rated in sort of a manpower priority plan. Management in establishments high on the list will be able to encourage men to move from works having a lower rating. Contrary movement will be practically forbidden under the freezing program.

The Individual Job

Individuals having skills needed for the production program will more than ever be protected against assignment to routine Army duties. But local boards will have grave difficulty in deciding these questions. Washington, therefore, urges that both individual workers and employers use every effort, even by formal appeals where necessary, to see that highly trained personnel, either artisans or of professional type, do not get sent off to some task which does not really require their type of skill.

The "squeeze" method is being applied in many cases. This has sanction, in fact was largely initiated from Washington. A man with dependents who for that reason ought not to go at this time into active military service is being pushed out of less essential and into more necessary employment. Sometimes the local boards appear to threaten reclassification as 1-A in order to induce such individuals to take jobs of importance for which their skill fits them.

There is no local authority to reclassify individuals in 1-A if there are bona fide dependents as defined by law. There is no authority for local boards to send 3-A men into the Army when others with 1-A classification are available. But these points are often not explained to the individuals when the local group is trying to fill important war factory posts with persons now busy on what seems to them less necessary work.

Washington admits that there are going to be many mistakes made. But they think that the net result of pressure is going to be good for the war effort. They fear the resentment caused by indiscreet and unfair pressures. But they fear still more a lag in getting essential jobs filled. Hence, they take a chance on resentment and on some unfairness.

During May Washington came to the conclusion that too many new plants had been started. It began definitely to back down on the program of building and expansion. Even some explosives works, magnesium plants, and others high on the priority list will not be built as originally planned. Contract cancellation or reduction of contract activity is being quietly arranged for these and other of the many less pressing projects.

Unquestionably some sorts of explosives works will be further expanded. The synthetic rubber and rubber chemicals programs will be pushed with the utmost speed. A few other kinds of chemical manufacture will be encouraged to the limit. But these will be the striking exceptions to the general trend. Only such works as can be finished early in 1943 are sure to be completed in most industries.

Far greater emphasis on second-hand equipment and make-shift engineering will follow. In the synthetic rubber program it is definitely expected that about 200,000 tons of capacity will probably have to be built largely with reclaimed or makeshift equipment. It is hoped that the petroleum industry can, for example, somehow maneuver its business to make butyl rubber without requiring new metals or scarce machinery.

In every case, speed in completion and maximum capacity output are the criteria by which a proposal is judged. Initial cost and relative cost of the product is almost completely ignored. Only when one works can use a much less scarce metal of construction than another does it get a chance if the time of completion is later.

Nitrogen Situation

Problems of nitrogen supply for explosives and for fertilizers continue to require serious official study. The fertilizer industry got through the season just closed without any significant shortages. But it has been notified that it will get practically no ammonia or ammonia liquor for direct ammoniation from now on. It is being asked to use huge quantities of oil-seed meals as a source of nitrogen; and it is hoped that generous supplies of Chilean nitrate can be supplied by import. However, there are both economic and technical questions still to be settled.

The nitrogen content of the meals offered is low, so that only small percentages of nitrogen can be so added. The supply of Chilean nitrate is bound to be short; and in any event, not too much can be put in mixed formulas. Hence, it is urged that some ammonia for superphosphate treatment should be released in order to maintain adequate nitrogen content without danger of loss in storage or transit and to avoid greatly reducing the capacity of manufacturing works for proper cure of superphosphate. With half as much ammonia equivalent next year as last, the industry probably could get by pretty well.

When meal is substituted as a nitrogen source, it produces really a new kind of fertilizer. It also greatly increases the cost per unit of nitrogen. Fertilizer spokesmen, therefore, argue that the price ceilings based on old price schedules cannot be applied without breaking the industry. Some kind of readjustment is going to have to be made with the cooperation of the Department of Agriculture, the Office of Defense Transportation, and O.P.A. All are urging that W.P.B. allot some ammonia so that these problems of manufacture and transport are not too difficult for practical solution.

The proposal that farmers grow a maximum of winter legume to be plowed in next spring, instead of using high nitrogen fertilizers, will be followed to some extent. However, there is not nearly enough seed to do all that has been proposed. And many farmers are either unacquainted with good practice or unwilling to attempt it, it is reported.

Transport Regulations

Seemingly important transport regulations of Office of Defense Transportation practically put out of business momentarily some divisions of process industry. Most significant was the ruling that closed freight cars and tank cars could not be used for short haul business. The theory was that ordinary trucks and tank trucks would take their place. In practice there were no tank trucks available and the ordinary trucks could, under the rules, run only 75 percent of the previous typical mileage. Hence, they too were virtually unavailable. Gradually, specific cases are being worked out by individual permits and some industry-wide exemptions are being granted.

Comparable readjustment is being attempted in certain cases to permit over-the-road reliveries without capacity loading out-bound and 75 percent of capacity load on the return trip. That ruling caused great difficulty in some industries, for example, in the fertilizer industry where it practically forbade any truck deliveries of fertilizer.

Delivery pooling arrangements are being organized generally with full official sanction in Washington. However, cooperation of O.D.T. and approval of the Department of Justice is still essential for protection of executives of competing companies when they prepare any such agreement.

New Controls

Almost daily chemicals and the products of process industry are put under further regulation. Full allocation now applies to white arsenic, tantalum, high wines, zinc, kyanite for furnace linings, sperm oil, and a flock of other industrial materials of chemical interest. In some cases, like acrylonitrile, the allocation rules are intended to protect the single important war use, synthetic rubber manufacture. But in most cases the programs are

more important to secure equitable distribution of inadequate supplies.

Import controls now extend to all classes of fats and oils, cinchona, corundum, to name but a few that came under regulation near the end of May. Export control is, of course, complete.

When the general price ceiling regulations took effect, they did not supersede many of the then active special price ceilings. Approximately 150 commodities or industries remained under such specific control. A few more industries are being added weekly to this list. The purpose is to eliminate inequitable situations within an industry or to prevent breakdown of some important division of commodity supply.

The new specific ceilings so imposed are usually not intended to widen profit margins. In such cases O.P.A. prefers to try the "roll back" technic. Under it the price of raw materials will be regulated to lower levels, re-establishing a manufacturing margin by lowering cost. This scheme was first applied to pickled sheepskins to permit leather manufacture to continue. Other similar actions are promised.

Alcohol Capacity Boosted

Production of over a half-billion gallons of industrial alcohol next year is promised by an official report of W.P.B. released late in May. The new program is based on plant capacity and surplus from the current year as follows:

	Million gallons
Synthetic (from ethylene gas)	65
Whiskey plants now making 190 proof	120
Whiskey plants to be converted	120
New Orleans industrial alcohol plants	65
Seaboard industrial alcohol plants	160
Cuba and Mexico	10
	540
Surplus from 1942	50
	590

This supply exceeds present demonstrated military and essential civilian demands for 1943 which are now estimated as 476 million gallons. That total includes 200 million gallons of alcohol for butadiene manufacture, as a part of the synthetic rubber program. It also includes the estimated requirements for explosive manufacture the largest single military item. Some, but not large, provision is made for anti-freeze, especially for the Army.

Synthetic alcohol plants could have been established to care for much more of the alcohol needed than is above indicated. To have done so would have required use of scarce metals and very scarce chemical engineering machinery and equipment. The lower cost of the alcohol per gallon, if made by the synthetic process, was deemed less important to the government than the saving of these scarce materials.

Supply of alcohol from beverage plants is far exceeding original estimates. Complete conversion of whiskey plants capable of making 190 proof alcohol has been accomplished. To convert other smaller plants there are being moved at least 20 rectifying stills from the Pacific Coast and several from other distilleries which will not operate. Much of the capacity which centers around Louisville, Kentucky, is thus being stepped up to provide complete facilities at each plant to deliver 190 proof. Only a small amount of the whiskey plant alcohol will have to go to other works for proofing up.

The industrial alcohol plants of the New Orleans districts will be supplied with molasses or sirup raw materials from domestic sources without taking food sugars. Eastern Seaboard plants will get as much blackstrap of inedible grades as can be brought from Cuba, Porto Rico, and other islands. Shortage of tankers, of course, limits this supply.

A number of the Eastern alcohol works are being converted to a grain base, partly or fully. Some may be supplied with a grain molasses made elsewhere from wheat or corn. No more use of high test molasses prepared from edible sugar is anticipated. A combination of novel chemical engineering procedures is now saving all such sweetener for the sugar bowl.

Without extensive adaptation of existing works, the new alcohol program would have placed a tremendous burden on steel and equipment markets. W.P.B. estimates that 550 tons of steel plate, 790 tons of structural steel, 70 tons of copper, and 4 tons of bronze, as well as other materials of construction, are needed to build a plant having only 2.5 million gallons of alcohol capacity per year. Since 100 such plants would be needed to equal whiskey plant output alone, it is evident that the program as developed is saving immense amounts of structural material.

Initial estimates indicate that 136 million bushels of grain will be employed in the alcohol program. Corn, rye, and wheat are now being used, approximately in that order of importance. However, further expansion is going to be based more largely on wheat. The purpose is twofold. The surplus of wheat is greatest. And some wheat must be moved soon out of granaries and elevators to make room for the 1942 crop.

Although based on existing facilities, the new alcohol program has a splendid geographic balance between output and requirements. Official figures show the following percentages for the five major geographic areas:

	Production Percent	Consumption Percent
North Atlantic states	57.45	57.75
Southern and Gulf states	20.05	19.42
North Central states	15.53	17.32
Midwest and southwest	4.87	3.06
Pacific Coast states	2.17	2.42

Extensive technical work is continuing to insure maximum cooperation of chemical engineers and industrial executives with various groups of officials involved in this program. It is evident that an even greater increase in alcohol output could be provided if by any chance additional military needs develop. The extreme estimates of the requirement of one billion gallons of alcohol per year are not likely to be realized, official Washington believes. But should that need develop, it probably could be met by still further makeshift in which cost would be sacrificed to secure speed in production with minimum equipment and metal usage.

W.P.B. Chemicals Branch

About the time the Chemicals Branch moved into its present quarters in the Railroad Retirement Building, a reorganization of the Branch was put into effect. And now probably for the first time the type of control employed in the Chemicals Branch has been laid out on paper and the functions of the various parts of the Branch clearly delineated.

The organization chart shows seven operating sections under the supervision of two Assistant Branch Chiefs. It is the duty of these sections to promote production and to pass on allocations of materials. This elastic setup provides not only for present requirements but also for expansions that may become necessary in the future. Particular emphasis is being placed on materials that are tight at the present time while materials that may become tight and require close supervision in the future are being given considerable study.

The duties of the staff sections cut across the entire commodity picture. The Technical Advisory Section is a liaison group dealing with military requirements. It is the go-between the armed services, the Board of Economic Warfare and similar organizations and the Chemicals Branch.

The Projects and Facilities Section passes on applications for new projects and allocates the available materials. The Maintenance and Repair Unit administers Order P-89 which regulates the supply of equipment and operational materials for plant maintenance and repair.

In the chart the dotted line indicates assigned personnel. The Priority Specialists are the liaison with the Director of Industry Operations and actually lend priority authority to the Chemicals Branch. The duties of the rest of the assigned personnel need no explanation.

Chemical Miscellany

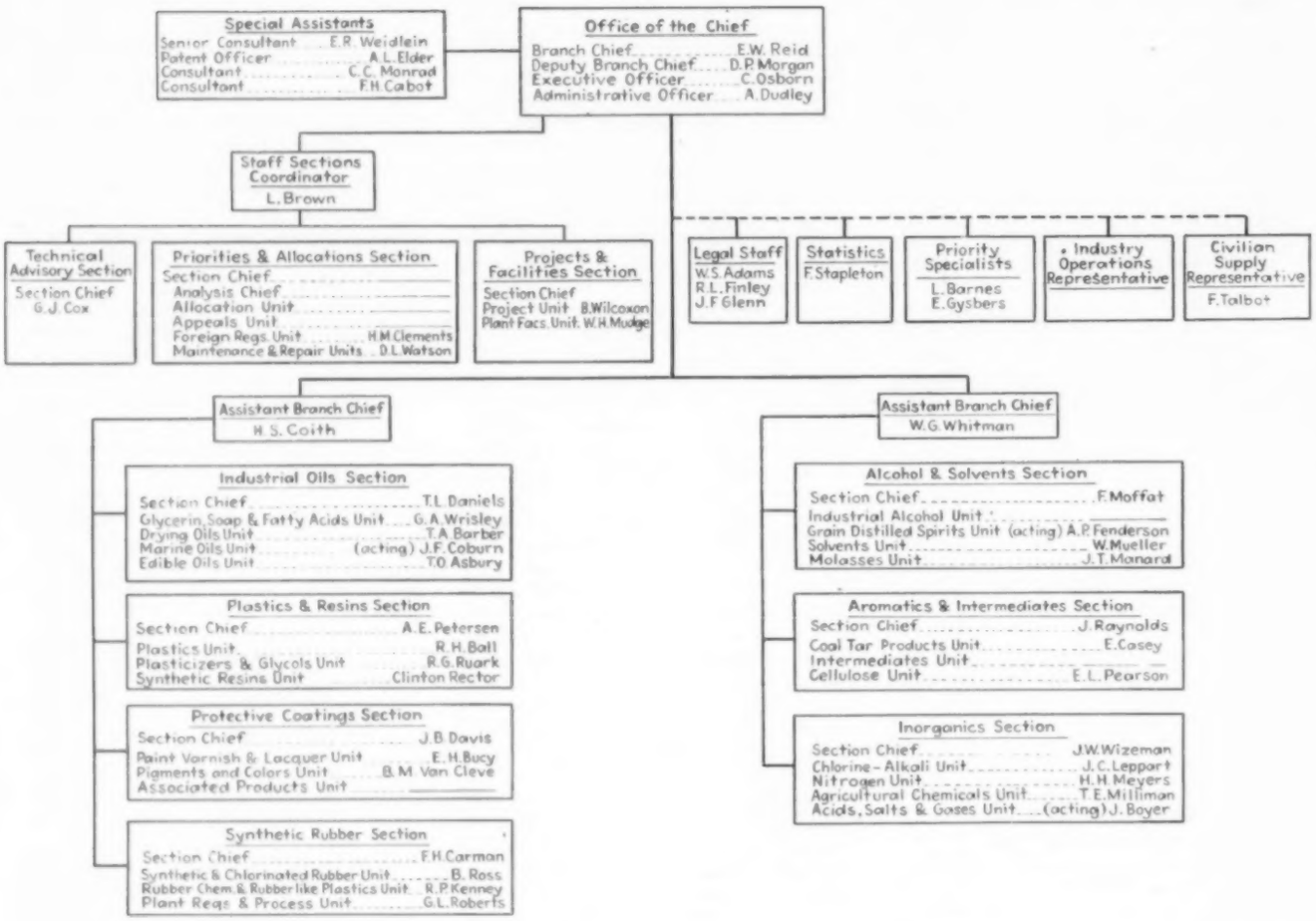
Quicksilver Find—An important mercury ore deposit has been discovered by the Bureau of Mines in Idaho. This is one of the outstanding items reported from the mineral explorations for strategic commodities, which the Bureau has been conducting for several years.

Carboy Manual — During May the Manufacturing Chemists' Association distributed its new glass carboy manual. Any companies shipping chemicals in such containers are being urged to follow the new instructions in detail.

WAR PRODUCTION BOARD

MATERIALS DIVISION

THE CHEMICALS BRANCH



TEACHERS WILL HOLD CHEMICAL ENGINEERING SYMPOSIUM

Columbia University and the Polytechnic Institute of Brooklyn are to be hosts to the Chemical Engineering Division of the Society for the Promotion of Engineering Education at two technical sessions on Saturday, June 27, and Monday, June 29. The meeting at Columbia University, beginning at 2 P.M., on June 27, will feature a symposium on safety and another on chemical engineering reports and patent protection. Myron A. Snell, supervising engineer of Hartford Accident and Indemnity Co., opens the discussion with "Safety in Industry" and will be followed by Professor M. M. Braidech of Case School of Applied Science on "Industrial Hazards" and Professor C. O. Miller of the same institution on "Safety Instruction for Chemical Engineering Laboratories." Professor Frank C. Vilbrandt of Virginia Polytechnic Institute, will lead the round-table discussion.

"Chemical Engineering Reports" is the title of a paper by Professor Fred H. Rhodes of Cornell University, who will be followed by A. H. Deller, patent attorney and chemical engineer, speaking on "Patents and the Chemical Engineer."

At the Polytechnic Institute at 10 A.M. on June 29, Professor J. H. Rushton of the University of Virginia, discusses "Chemical Engineering Equipment and Design". Dr. V. I. Komarewsky of the Illinois Institute of Technology, will discuss the teaching of catalysis and Professor Ernst Hauser of Massachusetts Institute of Technology has a paper on "The Importance of Colloid Chemistry in Chemical Engineering Courses."

The Chemical Engineering Division plans an informal dinner at 7 P.M. on June 27, at which S. D. Kirkpatrick, Editor of *Chem. & Met.* and president of the American Institute of Chemical Engineers, is to speak on "The Chemical Engineer and the Present World Conflict."

PAINT INDUSTRY WILL HONOR ERNEST T. TRIGG

Ernest T. Trigg, president of the National Paint, Varnish & Lacquer Association, who this year will celebrate his golden anniversary as a member of the paint industry, will be honored on June 30 at a dinner sponsored by the Philadelphia Paint, Varnish & Lacquer Association at the Union League in Philadelphia. Leaders of the paint industry from all parts of the country as well as representatives of affiliated trades and civic leaders will be in attendance. Walter A. Gorrell, president of the Philadelphia association will serve as toastmaster and addresses will be made by men prominent in the paint field.

Mr. Trigg has long been a dominant figure in paint trade association activities, having been a member of the Educational Bureau since 1906, and chairman since 1927. He was president of the Paint Manufacturers' Association of the United States in 1911, president of the Philadelphia Paint, Oil & Varnish Club, 1918-1921, president of the National Paint, Oil & Varnish Association in 1922, and served as a director of the American Tung Oil Corp. since its inception. He also served as chairman of the General Code Committee for the paint and varnish industry in 1933.

APPROPRIATION RECOMMENDED FOR RESEARCH PLANT

The Senate Appropriations Committee at the end of May recommended an appropriation of $85,000 be voted the Bureau of Mines for construction and equipment of an experimental plant for conducting research on the production of gasoline and oil from coal by the Fischer-Tropsch hydrogenation process. The plant will have a daily capacity of 100 pounds of gasoline.

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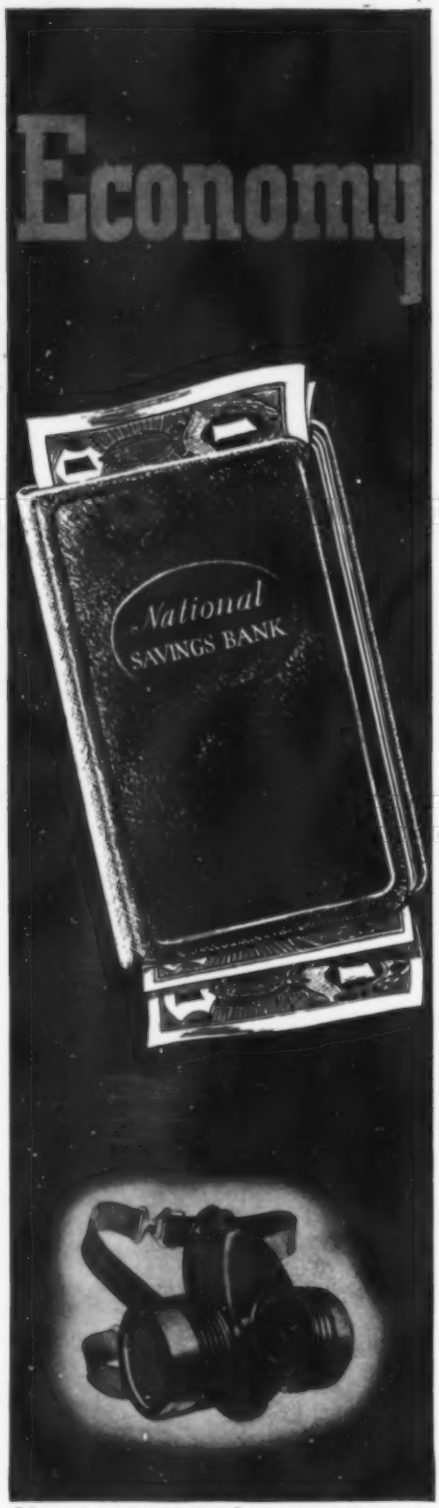

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READING, PA. U.S.A.

CONSUMPTION OF TURPENTINE AND ROSIN INCREASED IN LAST NAVAL STORES YEAR

THE Bureau of Agricultural Chemistry and Engineering has issued its report on the naval stores industry for the crop year ended March 31, 1942. This report which gives data for production, distribution, consumption, and stocks of turpentine and rosin, reveals that the conservation program which is being carried out under government auspices has had the effect of cutting down outputs of gum turpentine and rosin. As demand for these products has been on an ascending scale, the statistical position of the market has improved with an appreciable decline in the volume of carryover stocks at the close of the last fiscal year.

Planned curtailment in the gum turpentine and rosin fields has kept the production line on a downward curve in recent years and the loan program has enabled holders of stocks to refrain from pressing sales so that values have been higher accordingly. The wood branch of the industry has been working without any artificial limitations and to a certain extent larger outputs in that direction have affected the overall reduction in carryover stocks. At any rate, producers of wood turpentine and rosin have been steadily forging ahead with respect to the proportion of consuming markets which they are serving.

In the 1940-1941 crop year, production of wood turpentine accounted for a little under 40 percent of total output and last season this percentage was raised to more than 48 per cent. Of the consumption totals for the same periods, the wood turpentine branch controlled more than 40 percent as compared with less than 36 percent in the preceding year. Comparisons are even more favorable for wood rosin as for the first time, production surpassed that coming from producers of gum rosin and consumption of the wood product was larger than the output so that surplus stocks were drawn upon to satisfy consuming demand.

Owing to the fact that export and import data for naval stores no longer are made available, it is not possible to make the usual comparisons for domestic consumption but from the figures given for available supplies and the carryover totals, it is evident that there was a large increase in home consumption of both turpentine and rosin in the last fiscal year.

In the case of turpentine, distribution according to industries appears to have followed closely the change in industrial activity with no indication that new outlets had been developed. Rosins, on the other hand, not only were benefited by the rise in general business but also by the growing importance of some products for which rosin is a necessary raw material. This is illustrated in comparing the amounts of rosin used in making ester gum and synthetic resins where the total reported for 1940-1941 was 127,230 bbl. and that for 1941-1942 at 270,477 bbl. Natural gums which ordi-

Production of Turpentine

(50-gal. bbl.)

	Total	Gum	Wood	Total	Gum	Wood
Gum	285,050	285,050	.....	343,938	343,938	.....
Wood, steam distilled	190,048	.....	190,048	161,161	.....	161,161
Wood sulphate	64,986	.....	64,986	54,081	.....	54,081
Wood dest. dist.	8,712	.....	8,712	7,161	.....	7,161
Total	548,796	285,050	263,746	566,341	343,938	222,403

Production of Rosin

(500-lb. bbl.)

Gum	964,932	964,932	.....	1,148,413	1,148,413	.....
Reclaimed	24,706	24,706	.....	25,226	25,226	.....
Wood, steam distilled	1,145,955	.....	1,145,955	973,226	.....	973,226
Total	2,135,593	989,638	1,145,955	2,146,865	1,173,639	973,226

Supply and Distribution of Turpentine

(50-gal. bbl.)

	April 1, 1941–March 31, 1942			April 1, 1940–March 31, 1941		
	Total	Gum	Wood	Total	Gum	Wood
Carryover, April 1	209,910	146,735	63,175	220,267	167,943	52,324
Production	548,796	285,050	263,746	566,341	343,938	222,403
Imports	.....	.....	.....	16,888	16,888	.....
Available supply	758,706	431,785	326,921	803,496	528,769	274,727
Carryover March 31	156,369	86,448	69,921	209,910	146,735	63,175
Apparent consumption	602,337	345,337	257,000	593,586	382,034	211,552
Exports	.....	.....	.....	130,855	103,127	27,728
U. S. consumption	.....	.....	.....	462,731	278,907	183,824

Supply and Distribution of Rosin

(500-lb. bbl.)

Carryover April 1	1,874,160	1,653,235	220,925	1,569,396	1,409,649	159,747
Production	2,135,593	989,638	1,145,955	2,146,865	1,173,639	973,226
Imports	.....	.....	.....	.....	.....	.....
Available supply	4,009,753	2,642,873	1,366,880	3,716,261	2,583,288	1,132,973
Carryover March 31	1,434,677	1,230,817	203,860	1,874,160	1,653,235	220,925
Total consumption	2,575,076	1,412,056	1,163,020	1,842,101	930,053	912,048
Exports	.....	.....	.....	535,128	278,671	256,457
U. S. consumption	.....	.....	.....	1,306,973	651,382	655,591

NEW ALKYL PHOSPHORIC ACIDS

Suggest Varied Possibilities

THESE five alkyl phosphoric acids, now available in experimental quantities, have already attracted the interest of research and development men in several industries. Patents have been issued which indicate their value as catalysts and polymerizing agents in the manufacture of resins . . . as polymerizing agents in the processing of drying oils . . . and as water-insoluble, rust- and corrosion-proofing compounds. In addition, their metallic salts have also shown promise in several different fields.

While the raw materials situation makes supplying of commercial quantities uncertain at present, experimental quantities are available and samples will be sent on request. MONSANTO CHEMICAL COMPANY, Merrimac Division, Everett Station, Boston, Massachusetts.

ETHYL PHOSPHORIC ACID

1. **Specific gravity:** 1.33 at 25° C.
   Color: pale straw-colored liquid.
   Alkyl acid content: approximately 97%.

NORMAL BUTYL PHOSPHORIC ACID

2. **Specific gravity:** 1.24 at 25°C.
   Color: fluorescent reddish amber.
   Alkyl acid content: approximately 99%.

AMYL PHOSPHORIC ACID
(a pentasol derivative)

3. **Specific gravity:** 1.33 at 25° C.
   Color: fluorescent reddish amber.
   Alkyl acid content: approximately 99%.

METHYL PHOSPHORIC ACID

4. **Specific gravity:** 1.439 at 25° C.
   Color: pale straw-colored liquid.
   Alkyl acid content: approximately 97%.

NORMAL PROPYL PHOSPHORIC ACID

5. **Specific gravity:** 1.30 at 25° C.
   Color: reddish amber.
   Alkyl acid content: approximately 97%.

SUGGESTED USES

1. As catalysts in the manufacture of urea resins . . . Ind. Eng. Chem. 33 512-15 (1941).
2. As materials for forming water-insoluble coatings on metals for rust or corrosion prevention. U. S. Patent 2224695.
3. As polymerizing agents for drying oils, resins, etc., as outlined in U. S. Patent 2223548.
4. Metallic salts of these alkyl phosphoric acids show promise as flame-proofing compounds for fabrics and paper . . . as alternates for glycerin in vat printing pastes . . . and as fiber lubricants for wool spinning. Ind. Eng. Chem. 34 20-25 (1942).

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MONSANTO CHEMICAL COMPANY, Everett Station, Boston, Mass.

Please send me samples of ☐ Methyl Phosphoric Acid ☐ Ethyl Phosphoric Acid ☐ Normal Propyl Phosphoric Acid ☐ Normal Butyl Phosphoric Acid ☐ Amyl Phosphoric Acid.

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Firm _____

Address _____ *City* _____

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STRUTHERS WELLS CORPORATION
WARREN, PENNSYLVANIA

narily are imported in large quantities, no longer are reaching this country as primary markets either are in enemy hands or transportation facilities are lacking for their movement, hence the outlook is very favorable for domestic rosins as replacement materials.

The price trend for turpentine was generally upward through October 1941 when the line started to move in the other direction but the average for the year was 63.85c. a gal. which was the highest since the 1926-1927 season. The season average price was obtained by multiplying each monthly price by the combined receipts during that month at Savannah, Jacksonville, and Pensacola and dividing this total for the season by the total receipts for the season.

The average price for rosin for the crop year was $6.19 a bbl. which was the highest since the 1937-1938 season when the average was $7.35 per bbl.

Reported Consumption of Rosin

(500-lb. bbl.)

	1941–42 (Apr.-Mar.) Total	1940–41 (Apr.-Mar.) Total
Abattoirs	1,020	957
Adhesives & plastics	23,069	16,793
Asphaltic products	4,584	8,734
Automobiles & wagons	585	503
Chemicals & pharmaceuticals	251,251	116,007
Ester gum & synthetic resins	270,477	127,230
Foundries & f'dry supplies	26,580	16,740
Furniture	134	15
Insecticides & disinfectants	5,669	3,678
Linoleum & floor covering	51,511	39,272
Matches	1,792	2,736
Oils & greases	41,031	30,108
Paint, varnish & lacquer	217,747	157,798
Paper & paper size	443,944	327,938
Printing ink	16,154	15,502
Railroads & shipyards	6,410	2,723
Rubber	7,076	6,553
Shoe polish & show mat'ls	12,151	8,563
Soap	251,368	191,266
Other industries	6,100	5,615
Total industrial reported	1,638,653	1,078,731
Not accounted for [1]	.....	228,242
Apparent U. S. consumption	.....	1,306,973

[1] Principally unreported industrial consumption of rosin and rosin for distribution through retailers who sell in small quantities to ultimate consumers

Reported Consumption of Turpentine

(50-gal. bbl.)

	1941–42 (Apr.-Mar.) Total	1940–41 (Apr.-Mar.) Total
Abattoirs	0	0
Adhesives & plastics	343	365
Asphaltic products	0	0
Automobiles & wagons	455	289
Chemicals & pharmaceuticals	55,625	40,413
Ester gum & synthetic resins	0	0
Foundries & f'dry supplies	1,055	847
Furniture	476	495
Insecticides & disinfectants	354	486
Linoleum & floor covering	52	78
Matches	0	0
Oils & greases	49	84
Paint, varnish & lacquer	63,849	51,437
Paper & paper size	0	0
Printing ink	237	230
Railroads & shipyards	7,865	6,107
Rubber	182	230
Shoe polish & shoe mat'ls	15,470	12,453
Soap	0	0
Other industries	317	1,029
Total industrial reported	146,329	114,534
Not accounted for	.....	348,197
Apparent U. S. consumption	.....	462,731

BRITISH INCREASE RESEARCH IN FIELD OF FINE CHEMICALS AND PHARMACEUTICALS

Special Correspondence

ANOTHER £500,000 company has been formed in the British pharmaceutical industry. It is the Imperial Chemical Industries (Pharmaceuticals) Ltd., and like the Therapeutic Research Corp., formed last November by five leading producers of fine chemicals it will be concerned mainly with research, though the statutes of the new enterprise describe the firm as "manufacturers of and dealers in fine chemicals, scientific apparatus and materials, oils, colours, dyeware, etc." It is stated that the formation of a new company is the logical outcome of work carried out by the parent company. The research activities of I.C.I. (Dyestuffs) Ltd. in the organic chemical field have for some years included the closely-related branch of chemical therapeutics. This research has enabled Imperial Chemical Industries Ltd. to produce many additional products previously obtainable only from foreign sources.

What is true of the pharmaceutical activities of the British chemical combine, also applies to the work of the smaller makers of fine chemicals. The range of British pharmaceuticals on the market compares very favorably with conditions before the war. The loss of Continental European supplies has been overcome without difficulty. Research work and planned production have placed British pharmaceuticals on a greatly enhanced level.

Loss of Far Eastern supplies, however, is bound to create new problems. Supplies of quinine are stated to be adequate for a considerable period, but the Ministry of Supply has taken steps for the manufacture of efficient substitutes. In the place of agar-agar a new product, sodium alginate has been offered for some time. The demand for this article has increased so enormously in the past few months that no new customers can be accepted by the manufacturer. It is pointed out that for many pharmaceutical preparations calcium alginate can be used. By addition of a suitable sodium salt such as sodium citrate viscous solutions have been obtained which are very similar to those of sodium alginate.

The supply of medicinal herbs and drugs will be increased under a scheme for the collection of medicinal plants in the British Isles which is under the control of the Vegetable Drugs Committee of the Ministry of Supply. Last year about £2000 worth of drugs—including 2 tons of dried digitalis leaf and 12 tons of digitalis seed—were collected. This year special attention will be paid to Atropa Belladonna, Colchicum Autumnale, Taraxamum spp., Digitalis purpurea, Dryopteris Filixmas, Urtica dioica, Sphagnum spp., and Valeriana officinalis. Drying sheds for medicinal plants are being built in all districts.

Economy in the use of bactericides is urged by the Therapeutic Requirements Committee of the Medical Research Council. Sterilization by heat is always preferable to the use of disinfectants. As mercury for mercurial compounds must be imported, indigenous coal-tar disinfectants are to be used mostly, and no shortage of these is anticipated provided the more highly purified substances are not used for purposes which can be served by cruder materials. Coal-tar disinfectants are to be replaced for special purposes by formaldehyde, hypochlorites, and chlorinated lime.

The British supply position with regard to insecticides and fungicides has been adversely affected by the need to economize in shipping and the loss of the Far Eastern territories (Malaya, Borneo and the Dutch East Indies) which normally provide all the derris root used. This can be replaced by lonchocarpus from Peru, Brazil and Venezuela, but must be shipped over wide distances—like pyrethrum from East Africa. Nicotine is in short supply, apparently owing to changes in the tobacco industry. Copper and sulphur for fungicides, though available, can be used more effectively for the war effort in other directions; consumption of copper sulphate in the British Isles before the war was substantially below production, a large part of which was sold abroad. Tar products for winter washes have been supplied in adequate amounts. Supplies of weed-killers are becoming scarcer, as chlorates are required for the manufacture of explosives, but tar-oil types can be used. Broadly speaking, supplies of insecticides and fungicides has so far been sufficient for real needs, but how much will be available in future depends upon the rival claims of other consumers.

The prospects for borax and boric acid in the field of agriculture continue to be most encouraging both in the United States and the British Empire, stated Mr. D. Abel Smith in his address to shareholders of Borax Consolidated Ltd. The consumption for agricultural purposes in the United States has almost doubled for the second year in succession. The need for more scientific approach to boron-deficiency problems is becoming more widely realized, and the outlook for the future is promising. Even more satisfactory appears the position in regard to industrial outlets. An increasing demand for borax and boric acid is reported for metallurgical processes, metal fabrication, fireproofing of textiles and timber, treatment of timber against attack from certain wood-boring insects, etc.

Evidence accumulates of the growing realization in official quarters of the vast significance of coal treatment by up-to-date methods. It is expected that a rationing scheme for coal, gas and electricity for domestic purposes will

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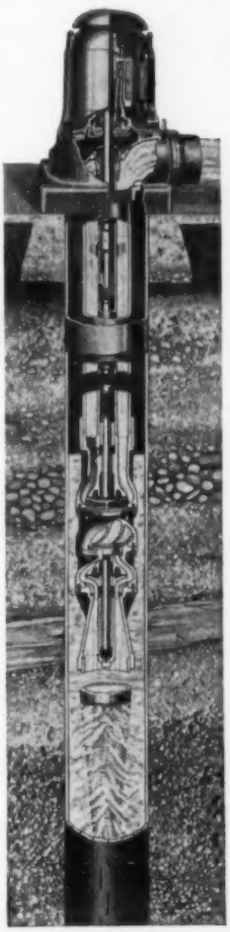

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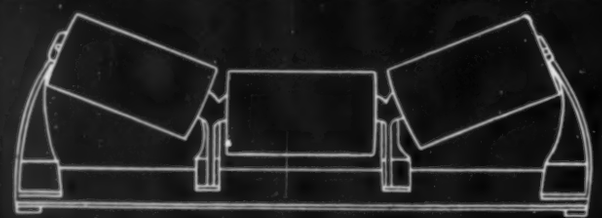

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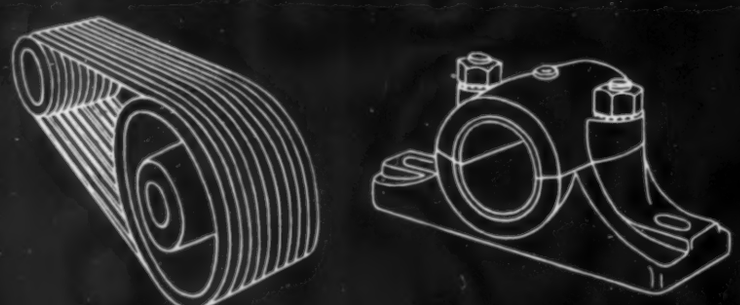

EQUIPMENT

CGC

Industrial Division
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soon be introduced. Imported fuel oil used in furnaces and heating plants is replaced by coal-tar oils, particularly creosote-pitch mixtures, as there is a surplus of these materials. Measures are also being taken to use coal-tar products in the place of imported bitumen. The recovery of benzol as a motor fuel and for the production of toluene has been pushed forward with the utmost energy. It is proposed to apply the Essential Works Order to coke-oven and byproduct plants to insure that these will have sufficient skilled labor. The possibility of erecting plants to work the Fischer-Tropsch process in England was examined by a government committee early in 1940. It was then turned down. But now their conclusions are being reconsidered, together with all other possible means of reducing the use of imported oil.

With an annual output of between 20 and 28 million tons, coke is in quantity the chief of all manufactured commodities made in Great Britain, exceeding even iron and steel. About three-quarters of all oven coke goes to blast-furnaces and cupolas, four-fifths of the gasworks coke is sold for heating water. A comparatively small part of the output is thus used for general industrial purposes, but it is believed that these are able to absorb much larger tonnages. On the other hand, it has been shown that coke and gas can be made from a far wider range of coals than was formerly supposed. Coals of surplus agglutinating power can, if blended with weakly caking coals and breeze, produce a coke of adequate strength. By improvement of existing refractory materials and the discovery of new ones it is hoped to open new fields in carbonization, with a consequent increase in output. On the side of consumption, if furnaces of reasonably low capital and operating cost can be made to work at various temperatures between 1500 and 2000° C, industrial processes may be exploited in Great Britain which have hitherto been the exclusive prerogative of countries where cheap hydro-electric power is available.

That interest in chemical treatment of coal has so greatly increased in Great Britain during the war is largely due to the realization that lack of indigenous sources of hydro-electric power, petroleum, etc. compels the country to make the fullest possible use of coal with which it is so well endowed. That the British Government is reconsidering the production of motor fuels by synthesis of water-gas is of special interest in this connection. The production of water-gas is now regarded as ancillary to carbonization as a means of securing flexibility, but it may be used in future primarily as a source of hydrogen and carbon monoxide for various synthetic processes in the aliphatic chemical industry which in England cannot draw upon either petroleum (as in U. S.) or on lignite (as in Germany). Chemical outlets for coke which will require larger supplies after the war are thermal drying

processes, calcium carbide manufacture, production of electrode carbon, filter purposes, and adsorption by activated coke. It is felt that these new demands for coke coupled with the improved position of liquid products from the carbonization industry will result in nothing short of a revolution in the British coal industry after the war.

Among chemical products for use in soldering fluxes, lactic acid has been studied by the Tin Research Institute. An aqueous solution of lactic acid (15 percent) proved an effective flux for soldering of copper, brass and bronze, even when tarnished, and is moderately good on clean steel. It can be much improved by the addition of a wetting agent which facilitates spreading of the flux and suppresses spluttering when the hot iron is applied. The addition of a small percentage of aniline hydrochloride (1 percent) to resin—one part in four parts of methylated spirit—considerably improved the effectiveness of this flux on tarnished copper, brass, bronze and tinplate. It is not recommended for use in sealed-up instruments having steel parts. When a non-corrosive flux leaving a non-greasy residue is required for soldering tinplate, 20 percent of resin, 5 percent of lactic acid, and 75 percent of methylated spirit has been found useful in conjunction with a cover of zinc-ammonium chloride on the solder bath.

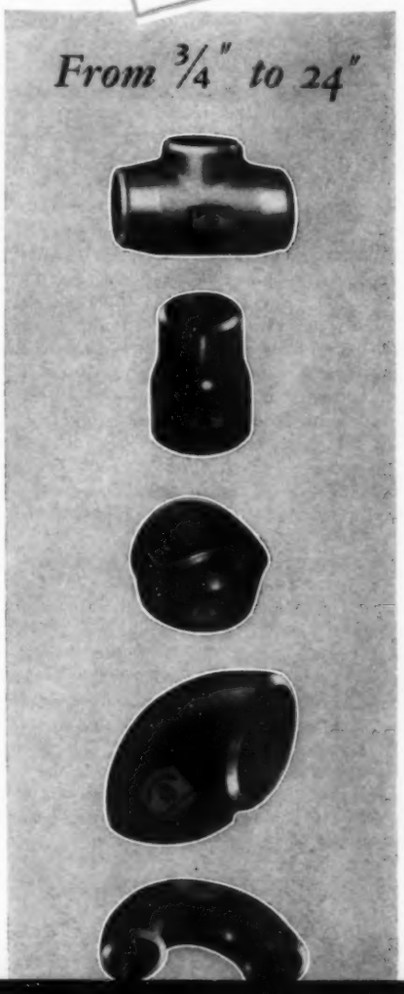
A mixture of four parts of resin and one part of mannitol is effective with tarnished copper and has a slight fluxing action on clean steel. The addition of 10-20 percent of lactic acid gives a flux which is very satisfactory with tarnished copper and brass. Another mannitol composition obtained by heating with lactic acid dissolved in methylated spirit contains 48 percent of resin, 12 percent of mannitol, 10 percent of lactic acid, and 30 percent of methylated spirit. This type of research work reflects a change in stress in tin development. The tendency at present is towards applications of tin where the metal is used sparingly. Work under the auspices of the Ministry of Supply has resulted in the development of four standard groups of white metals for bearings which are expected to result in considerable savings in tin consumption.

NEW POTASH DEPOSITS FOUND IN SOUTHWESTERN FRANCE

To compensate for the loss of Alsatian potash mines when Alsace-Lorraine was annexed by Germany, Mines de Potasse et de Magnesite is sinking a shaft in southwestern France where potash deposits have been discovered. After preliminary work is completed, it is expected to take up production as soon as possible.

The Kali Verein, Berlin, German potash syndicate, is staging a prize contest to encourage development of a new process for producing potash salts without having any waste end products. The contest closes October 1, 1942, and a prize of 175,000 RM is being offered.

Minutes here save hours later!



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Special Correspondence

EDITOR'S NOTE: *Cut off from direct correspondence with all except a few foreign sources in neutral countries, these notes interpret recent developments in continental Europe as reported in publications and official documents received in the United States. These monthly letters, prepared in this country, will be continued only so long as pertinent material of interest to American chemical industry is available for our comment and interpretation.*

STAKING a great deal in its drive in the Kerch peninsula, the German war machine is trying hard to reach Russia's great Caucasus oil bases centering around Grozny and Baku. These two adjoining areas supply 215 million barrels a year, or 80 percent of the Soviet Union's oil. Less than 1,000 miles to the south are the rich Near East fields stretching from Mosul, Iraq, through Iran to Bahrein in the Persian Gulf, producing 110 million barrels of oil a year.

Even though the United States produces roughly 60 percent of the world's oil output, the supplies of the Russian and Near East fields are of vital importance for the United Nations fighting in the Middle and Far Eastern areas since sources in the latter regions have fallen into Japanese hands. There the Netherlands Indies formerly accounted for 60 million barrels and Burma 8 million barrels a year.

The Rumanian oil wells, mostly formerly British owned, were seized almost intact over a year ago by the Germans. At best, however, their output is estimated at only 45 million barrels annually. German uneasiness over its own oil supplies as well as a desire to make them unavailable to the United Nations are important factors in the present drive. Germany has only a small production in the Reich and eastern-held territories, and synthetic oils are not too satisfactory for all purposes. The shortage in some types of oil is reflected in reports that refinery residues and shale oil products are now being used for lubricants in the Reich. These include residual oils from lignite carbonization, tar-fat oils, coal lubricating oils of high acid and sulphur content being used where oil is changed frequently, and residual oils from petroleum refining.

To replace mineral-oil using motors, the largest machine factory in the Reich, which incidentally, is also the oldest, recently celebrating its 100th anniversary, the "MAN" (Maschinenfabrik Augsburg-Nuremberg A.G.) is reportedly trying to develop new gas engines using domestic fuel materials. It claims to have improved the performance of gas engines and to have developed a new stationary diesel which uses considerably less fuel than standard diesel types.

In 'Brennstoff und Waermewirtschaft," F. C. Wirtz reports successful experiments with generator gas produced from peat found in Holland. The peat must be hard and have a water content of not more than 25 percent. Wood and anthracite are also used widely in the Reich for producing generator gas, chiefly for trucks. There are now over 150,000 trucks in the Reich powered by wood gas generators. They are estimated to save 45,000 tons of gasoline per month for other purposes. Ordinary gas and liquefied butane, a byproduct of synthetic gasoline manufacture, are now being used to fuel trucks of under one and a half tons. Heretofore gas was used only on trucks over one and a half tons. During the course of 1942 German engineers plan to raise the number of trucks using this type of fuel from 75,000 to 100,000.

The Danish Ministry of Trade announced recently that about half the 11,000 trucks in Denmark which still use gasoline will be provided with gas generators. In addition, 1,800 passenger cars are also to be converted to producer-gas fuel as soon as a suitable generator has been developed. Sweden now operates about 75,000, or between one-fourth and one-third of the country's total motor vehicle fleet, with producer gas. Over half of the above figure represents trucks; 39.5 percent of the producer-gas vehicles use wood fuel and the rest mainly charcoal.

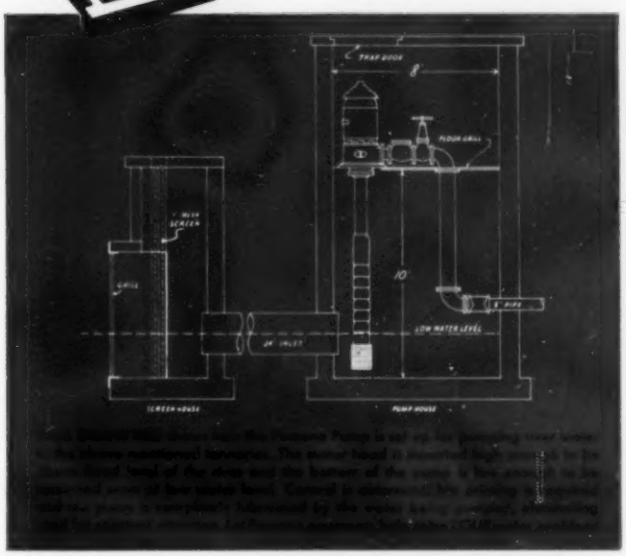
A Danish committee studying substitutes for petroleum is trying out on the open sea a ship propelled by means of a gas producer. According to reports, plans are well underway in developing a compact unit which can burn anthracite, briquettes, or similar fuel to develop the gas to run the ship's engines.

Denmark and Sweden have suffered considerable losses to their mercantile shipping fleets during the past year. Sweden reports that in the period from the outbreak of the war in September 1939 to the end of 1941 she lost 105 vessels, totaling 265,000 tons, or about 16 percent of the 1939 Swedish merchant marine. Domestic yards have been very active recently building Swedish naval and merchant units, and are also stated to be building some ships for German account. Dutch and Belgium shipyards are likewise reported to be building large numbers of inland river boats for Reich transportation firms.

Because of difficulties in obtaining cotton in Norway—an average of 4,000 tons of raw cotton in addition to 5,000 tons of cotton thread imported normally every year—flax production is being taken up again. Flax spinning by hand was a widespread home industry in Norway a century ago, and a modern spinning plant was erected in 1912, only to shut down later when it

The case of the Competitive Tanneries

and how BOTH solved their water supply problems with Pomona Pumps!



IN A large eastern leather tannery, the water supply problem had become acute. The service requirements were severe and the centrifugal pump with which water was lifted from a nearby river couldn't stand the pace. To keep water flowing to the plant, a complete extra casing and impeller assembly was kept on hand at all times just to handle replacement needs. But the excessive cost of "down" time and maintenance expenses made it imperative that another pump be installed—a pump capable of handling the water supply on a month-after-month basis without shut-downs or failures.

And since dependability was the keynote, this company naturally turned to Pomona!

A Pomona was installed, and after months of continuous operation this pump has eliminated shut-downs and boosted pumping efficiency so successfully that a *second* Pomona installation is now being planned.

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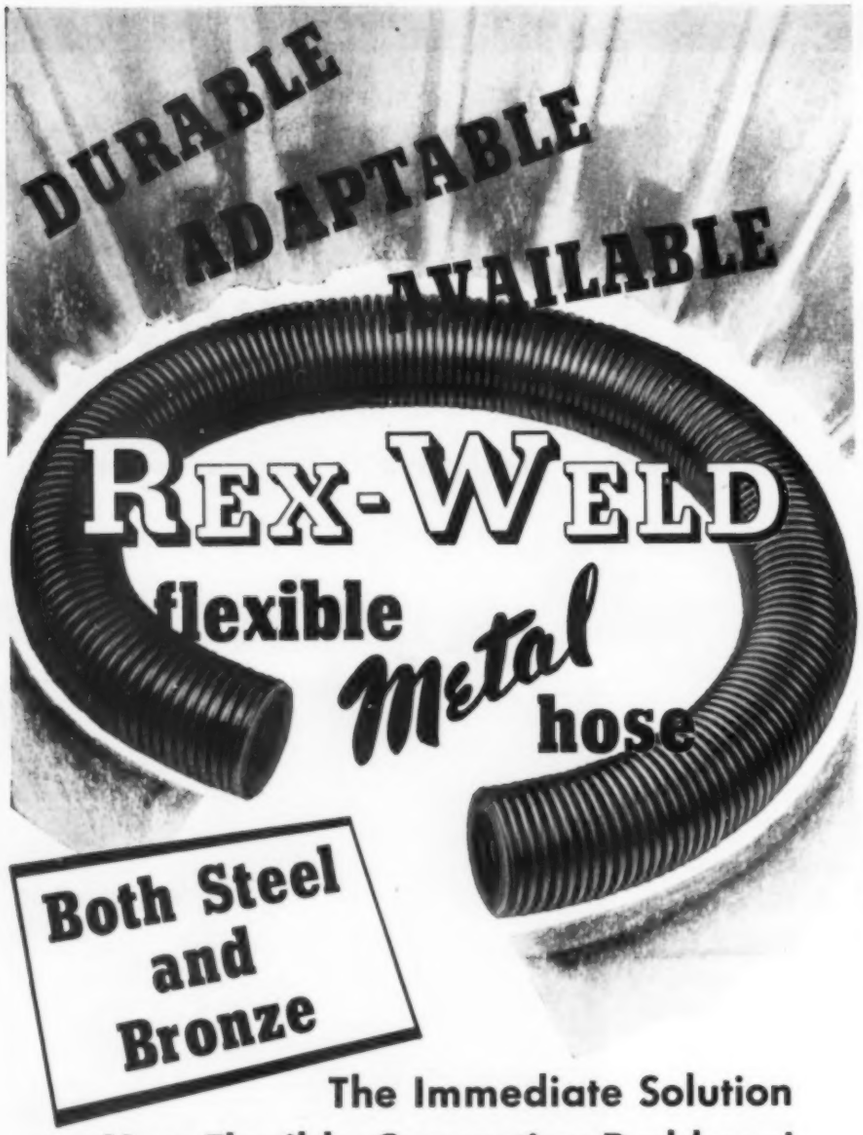

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Factories: Maywood and Elgin, Illinois

could not compete with imported flax products.

In a further effort to overcome textile shortages, the Borregaard Cellulose Corp., large Norwegian cellulose producer, recently founded a staple fiber company, with the German Phrix interests of Hamburg supplying the process and the Norwegians the raw materials. The Norwegian cellulose concern holds 60 percent of the stock, the German firm 25 percent, and a number of Norwegian textile processing concerns have taken the remainder of the stock. It is hoped eventually to establish a 90,000 ton yearly production capacity, which would cover inland needs and allow for some exports. The A-S Borregaard recently increased capital stock from 10 to 12 million kroner to form a new unit for local production of its carbon disulphide requirements. Formerly the company imported its carbon disulphide from Germany. With a supply of sulphur available and charcoal from its own forests, the company has completed plans for local production of the product needed in its cellulose processes.

In the Reich, carbon disulphide, most energetic of sulphurizing agents, is widely used as a solvent in manufacturing rubber goods, rubber cement, and rubberized cloth, as well as in dissolving natural grease out of wool and fatty oils out of seeds and oilpress residues, and in the recovery of oils from all kinds of waste materials. Large supplies of other chemicals are also required to process synthetic rubbers, which are in general more difficult to work than natural rubber. German claims, however, that as a result of longer experience with substitutes in the rubber, plastics, and synthetic fiber industries, they have improved machinery and equipment considerably. In the "Gummi Zeitung" it is reported that Buna can now be used successfully for dipped goods such as gloves. Although they cannot make transparent Buna nipples for baby's milk bottles, and still must use considerable amounts of natural rubber in making surgeons' gloves and thinner goods where strength, thinness, and elasticity are essential, certain advantages are claimed for the Buna products in addition to their chemical resistance. Although more dippings are necessary to get the same thickness as with natural rubber, it is claimed that dipping is more rapid with Buna, and that solutions can be made freer of bubbles than with natural rubber.

A product claimed to be a valuable substitute for chlorinated rubber is Vinoflex, exhibited in recent trade fairs. It is a synthetic increasingly used in preparing varnishes, showing high resistance to alkalis and acids, and it is being applied as a coating on light metals usually hard to protect. Various Vinoflex products are also supposed to improve on tars and bitumens. Newly-developed polyamide thermoplastics are finding somewhat different uses in Germany than in the

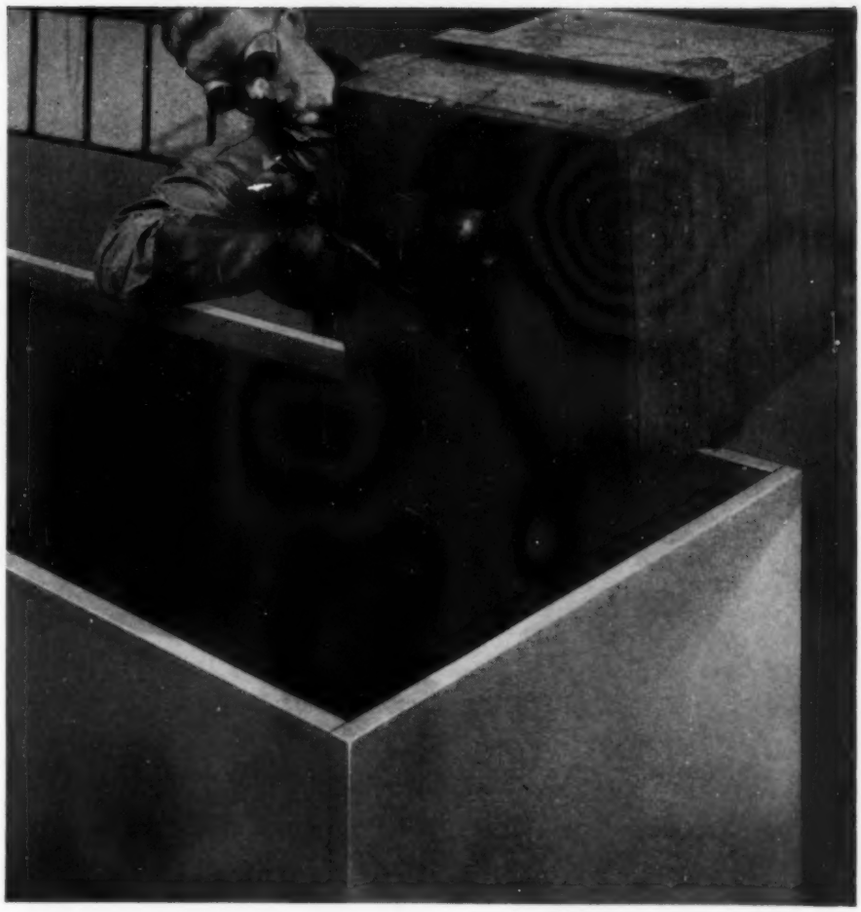
United States. Mixed polyamides, many of them soluble in alcohol are being used for impregnations, varnishes, etc. They have relatively low mechanical strength, but are claimed to be remarkably extensible. "Lupamides," polyamides marketed by I. G. Farben, are claimed when racked to have tensile strengths equal to those of light metals. Their chemical resistance is said to be lower than that of other thermoplastics and its water absorption rate high, but an advantage claimed is that they can be easily worked. I.G. markets several types, one with a heat resistance of 220 to 230 degrees C., and "Lupamide 85B" is being used as a substitute for leather.

Restrictions in the manufacture of polyvinyl chloride are to be seen in a decree stating that only firms in the Reich manufacturing polyvinyl chloride during the period from January 1940 to April 1941 can continue to produce and process it.

A polyvinyl chloride solution is being used in the U.S.S.R. as a substitute for shellac in the manufacture of phonograph records. Germany has apparently not yet developed a satisfactory substitute or synthetic for imported shellac. Since the outbreak of the war, old records have been processed to recover some shellac. Consumers are required to turn in a certain number of old records for each new one purchased. In this way it was hoped from 3 million old records to recover enough shellac to make about 2.25 million new ones. The latter figure represents about one-fourth the total number of records being currently produced in the Reich, the popularity of phonograph discs having declined steadily in Germany in recent years, probably as a result of radio competition.

To provide fertilizers for French agriculture, a new nitrogenous fertilizer company has been founded, "Société de Gestion du Groupement de l'Industrie de l'Azote." Chief stockholder is Kuhlmann, control of which was acquired last year by I. G. Farbenindustrie. Lesser stockholders are Grand Paroisse, St. Gobain, and Produits Azotes.

Because of shortages of electrode and zinc and other flashlight battery materials, improved World War I models of batteryless flashlights are on the market again in Germany. "A.E.G." (Allgemeine Elektrizitaets Gesellschaft) has developed a new batteryless flashlight, built on the same principle as bicycle dynamo lamps, which weighs only 285 grams. The housing is made of molded plastic, and a special bulb of 1.5 volts and 0.15 amps is used, although they will also take regular 2.5 volt flashlight lamps. The dynamo mechanism is operated by repeatedly pushing down a hand lever which operates gears inside and is pushed back by means of a spring. According to the "V.D.J. Zeitschrift," after one million times operation there was no appreciable wear on moving parts or deterioration in performance.



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5

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NITROHYDROXY DERIVATIVES OF THE NITROPARAFFINS

$CH_3-\overset{NO_2}{\overset{	}{C}}-CH_2OH$ $\quad\quad\quad

PERSONALITIES

George S. Cooper

C. W. Parmelee

✦ GEORGE S. COOPER was elected executive vice president of the Diamond Alkali Co. at a recent meeting of the board of directors. Mr. Cooper has been interested in the sale of Diamond products either with the sales department of the company or with one of its associates since 1919. For the past five years he has been vice president in charge of sales with his office in Pittsburgh, where he will continue in his new position.

✦ LOUIS J. TROSTEL of General Refractories, Co., Baltimore, Md., is the newly elected president of the American Ceramics Society.

✦ WILLIAM H. BROWNE has been named a research engineer on the technical staff of the Battelle Memorial Institute, Columbus, Ohio, where he has been assigned to the division of fuel research. Mr. Browne, a graduate in mechanical engineering of Rensselaer Polytechnic Institute, was associated with the Caterpillar Tractor Co., Peoria, Ill., prior to joining Battelle staff.

✦ ALLAN D'APERY MILLS has joined the laboratories of Quaker Chemical Products Corp., Conshohocken, Pa., in the capacity of organic research chemist. Mr. Mills was previously associated with Rohm & Haas Co. for five years.

✦ J. PERZANOWSKI has joined the Quaker Chemical Products Corp. as an organic chemist. He was formerly connected with the laboratories of the United Gas Improvement Co., Philadelphia.

✦ F. L. CRADDOCK has been appointed sales manager of Mixing and Process Equipment Division of Edge Moor Iron Works. He will make headquarters at Edge Moor, Del. Mr. Craddock was formerly president of the Mixing Equipment Co.

✦ C. W. PARMELEE, head of the department of ceramic engineering at the University of Illinois, will retire in June. A testimonial dinner was given Professor Parmelee by Illinois alumni in Cincinnati at the time of the annual meeting of the American Ceramic Society. One hundred alumni from all branches of the ceramics industry attended the dinner.

✦ E. J. BARTH, petroleum technologist, of Three Rivers, Texas, has joined the research and development staff of National Oil Products Co., Harrison, N. J. Mr. Barth, who is a graduate of Columbia University, has several patents to his credit in the field of chemistry.

✦ CLINTON P. DORISS, until recently affiliated with the Darco Corp., New York, is now in the U. S. Army. Doriss is a Dartmouth graduate of 1937.

✦ HERBERT R. QUINA, chemical engineer with the American Agricultural Chemical Co., New York, and assistant secretary-treasurer of the Junior Chemical Engineers of New York, has recently accepted a position with the War Production Board in Washington. Mr. Quina received his chemical engineering degree from the University of Florida in 1939.

✦ CHARLES F. DUCHACEK, chemical engineer formerly with M. R. Scharff Co., is now in the products research and development division of Arabol Mfg. Co., Brooklyn, N. Y.

✦ R. W. MILLER, who has been connected with Pittsburgh Plate Glass Co. for 12 years, has been appointed manager of the technical service department of the company's Columbia Chemical Division. Mr. Miller has been engaged in technical service activities since 1937 and succeeds Dr. G. L. Cunningham who has resigned. He joined the company in 1930 after receiving a B.S. degree in chemistry at Pennsylvania State College. After three years in the research department on pilot plant operations and general investigation, Mr. Miller was assigned to study on the uses of calcium chloride in soils for engineering purposes. He was active in promoting the principles of soil stabilization, now recognized as an improved method of highway and airport runway construction. Since 1937 he has assisted customers in the application of alkalis and chlorine.

✦ GRAHAM EDGAR, vice president and director of research, Ethyl Gasoline Corp., New York, will be the Marburg lecturer at the annual meeting of the ASTM, Atlantic City, June 24.

✦ J. A. SKOGSTROM joined the Kroger organization recently as an industrial engineer, according to an announcement by Joseph B. Hall, vice president of the Kroger Grocery & Baking Co., Cincinnati. Mr. Skogstrom has been associated for the past 16 years with Procter & Gamble Co. as chemist, production supervisor and cost engineer. He is a graduate of the University of Wisconsin.

✦ RAYMOND R. ROGERS has been appointed chief chemist at the Welland Chemical Works, Niagara Falls, Ont. Prior to joining this organization, Dr. Rogers was on the faculty of electrochemical department of Columbia University.

✦ NORMAN BAUGHN, who has been with Cook Paint & Varnish Co. for the past 12 years' has joined American-Marietta Co. of Chicago. A chemical engineering graduate of the University of Kansas, he has specialized in protective coatings for military needs.

✦ WILLIAM E. BRINKER, JR., has been appointed as associate professor of chemical engineering at the Northwestern University's new Technological Institute. He has been a member of the faculty of the University of Pittsburgh.

✦ LAURENCE M. RASMUSSEN was awarded the Charles M. Allen gold medal at the annual dinner of Pratt Institute Alumni of industrial chemical engineering. This medal is awarded annually to the alumnus of the chemical engineering department whose success in his profession, loyalty to Pratt Institute and service to the Alumni Association are outstanding.

✦ WALTER W. EDMAN, a chemical engineering graduate of Cooper Union, and for the past two years with M. W.

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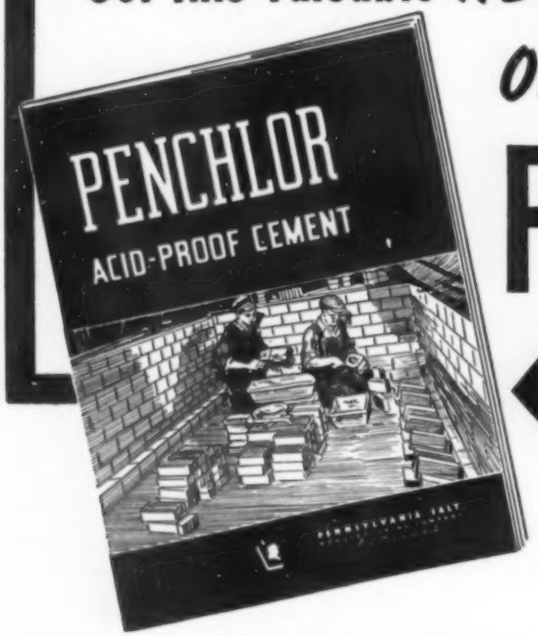

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Kellogg Co. and for six years prior thereto with Colgate-Palmolive-Peet, has been added to the chemical research division of Evans Cosmetics, Inc., New York, N. Y. Other additions to the research staff include Evelyn Klibaner, a Hunter College graduate and formerly in the laboratory of the General Dyestuff Corp., Fred Linsker, from the University of Vienna, Mildred Mellor, Hunter College graduate and formerly in the laboratory of Cheney Bros. Silk Co., Carl Seybold, formerly with Trojan Powder Co. and John Ross for a number of years with Max Factor Co. and recently with Ponds Extract Co.

✦ W. C. McINDOE is now a major in the Field Artillery. He is on military leave from his position on the Bonneville Power Administration Staff. He is a son of the late Brig. Gen. James F. McIndoe of the Corps of Engineers, U. S. Army.

✦ C. A. KNAUSS has been elected vice president in charge of eastern defense service of the Reichhold Chemicals, Inc. Prior to joining the Reichhold organization in September, 1939, Dr. Knauss was vice president of Nuodex Products, Inc., Elizabeth, N. J., and for several years prior to that he was a member of the staff of Dr. H. A. Gardner at the Institute of Paint and Varnish Research, Washington, D. C., and earlier taught chemistry at Lehigh University.

✦ DEAN E. MCCRORY, attached to the Pittsburgh office of the heavy chemical sales division of the Pennsylvania Salt Mfg. Co. since 1936, has been transferred to the company's executive offices in Philadelphia. Mr. McCrory graduated from Franklin and Marshall College and took graduate work in sanitary engineering at Carnegie Tech.

✦ CLINTON H. CRANE, president of the St. Joseph Lead Co., New York, N. Y., received the honorary degree of Doctor of Engineering at the commencement of the Missouri School of Mines and Metallurgy on May 1.

✦ A. J. MOSES has been elected vice president of Combustion Engineering Co. He is a graduate of Georgia School of Technology and has been connected with the Combustion organization since 1920, and for the past several years has been general manager of the company's Hedges-Walsh-Weidner Division at Chattanooga. He will continue to be responsible for operations of this major manufacturing division which is now engaged almost entirely in production related to the war effort.

✦ GEORGE G. STONER has been named to the technical staff of Battelle Memorial Institute, Columbus, Ohio, and has been assigned to chemical research. Dr. Stoner, a graduate of Wooster College of Ohio State University, and of Princeton University, was associated

with Pittsburgh Plate Glass Co., Barberton, Ohio, prior to joining the Battelle staff.

✦ GEORGE F. WHEATON, manager of the Josephtown, Pa., plant of St. Joseph Lead Co., received the honorary degree of mechanical engineer from Stevens Institute of Technology June 4.

A. C. Fieldner

✦ A. C. FIELDNER, head of the technological branch of the U. S. Bureau of Mines in Washington, has been awarded the Melchett Medal. The award is made by the Institute of Fuel, which was formed by an amalgamation of the Institution of Fuel Technology and the Institution of Fuel Economy Engineers. The Melchett Medal was given by the first Baron Melchett who established a trust fund for the annual award. He was the first president of the Institution. The medal is awarded annually to such person, whether a member of the Institute of Fuel or otherwise, as in the opinion of the Council has done either original research or professional, administrative, or constructive work of an outstanding character involving the scientific preparation or use of fuel, provided the results of such work have been made available within recent date for the benefit of the community.

✦ EDWARD V. OSBERG has been named vice president in charge of all sales and technical service for the Wilmington Chemical Corp., New York, N. Y. Mr. Osberg comes to his new position with a background in the rubber industry. During the past five years he has been a member of the editorial staff of *India Rubber World*, more recently as executive editor.

✦ HARRY F. REID, JR., has been appointed a research engineer on the technical staff of Battelle Memorial Institute, Columbus, Ohio, and has been assigned to ceramic research. A graduate of Geneva College, Mr. Reid was associated with the Ceramic Color and Chemical Mfg. Co., New Brighton, Pa., prior to joining the Battelle staff.

Raschig Rings

Of "U. S." White Porcelain and Chemical Stoneware are Denser, Tougher and Stronger

Any Comparative Test Quickly Proves . . .

"U. S." White Porcelain or Chemical Stoneware Raschig Rings will do a better job for you.

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THE Pot of Gold people seek at the end of the rainbow is wreathed in mist and never has quite been reached. Very different is the story of those who have investigated the myriad possibilities of Furfural. Just one case where Furfural proves itself a tangible "Pot of Gold" is in its use as a.....

SELECTIVE SOLVENT

Furfural

The selective solvent applications of this aldehyde are based largely on the fact that in a series of compounds the solubility in Furfural increases with higher degrees of unsaturation.

In the case of petroleum, Furfural extracts unsaturated sludge-forming entities. In refining wood rosin, Furfural has gained distinction by extracting the color bodies which heretofore caused large quantities of material to be without a ready market. Recent work indicates that Furfural offers possibilities in separating drying and non-drying fractions of vegetable and animal oils.

TYPICAL PROPERTIES:

Boiling point	157-167°C. (99%)
Specific gravity (20°C.)	1.161
Flash point (open cup)	56°C.
Freezing point	— 36.5°C.
Color	Straw yellow to amber

Other major uses are as a resin reactant, wetting agent, preservative, general solvent, and impregnating agent.

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The Quaker Oats Company

TECHNICAL DIVISION 5-6

141 W. JACKSON BLVD. CHICAGO, ILLINOIS

FURFURAL - FURFURYL ALCOHOL - HYDROFURAMIDE
... TETRAHYDROFURFURYL ALCOHOL ...

✦ DAVID E. PIERCE of Charles Lennig & Co., Bridesburg, Philadelphia, Pa., has resigned in order to accept a position with General Aniline & Film Corp. He will be engineering assistant to Colonel Bates and is located in the New York office.

✦ G. D. SHERMAN recently resigned as assistant chemist with the Chemistry Department, Experimental Station of Kentucky, to accept a position as assistant chemist with the Sweet Potato Products Division of the Southern Regional Research Laboratory, New Orleans, La.

✦ JAMES O'CONNELL, a 1940 graduate of De Paul University, has resigned his position with Armour & Co., to become a chemist for the E. I. du Pont de Nemours & Co., in the Kankakee Ordnance Works.

N. B. TUCKER

✦ N. BEVERLEY TUCKER is now technical adviser in the Devoe & Raynolds Co., Louisville, Ky. Mr. Tucker was formerly head of the Organic Research Laboratory, Research Department, of Procter & Gamble.

✦ E. CLIFFORD WILLIAMS, vice president and director of research for General Mills, was awarded the 1942 William H. Walker Award Medal of A.I.Ch.E. The medal is awarded annually for an outstanding contribution to chemical engineering literature published in the Institute Transactions by a member during a three-year period prior to the award.

✦ FRANCIS R. HOLDEN, a specialist in healthful working conditions, has been appointed as industrial hygienist on the staff of Industrial Hygiene Foundation at Mellon Institute. Dr. Holden took his undergraduate work at Hobart College. He has specialized in industrial hygiene since completing his graduate studies at the University of Cincinnati in 1934.

✦ F. M. TILLER, instructor of chemical engineering at the University of Cin-

cinnati, will assume the position of assistant professor of chemical engineering in the Vanderbilt School of Engineering.

✦ GEORGE F. KROHA, vice president and general sales manager, and George C. Calvert, vice president in charge of the Elyrie, Ohio, plant, have been elected to the Board of Directors of the Pfaudler Co.

✦ ALFONSE PECHUKAS has been named acting director of research of the Columbia Chemical Division of Pittsburgh Plate Glass Co. succeeding Dr. Irving E. Muskat, resigned. Dr. Pechukas whose headquarters are at Barberton has been associated with the company for the past five years. He holds the degrees of B.S. and Ph.D. from the University of Chicago.

✦ WILLIAM K. LAUTNER has been awarded a new research fellowship in chemical engineering at Vanderbilt University. Mr. Carl McFarlin, president of Tennessee Products Corp. has made the fellowship available.

✦ R. D. HOWERTON has been made manager of the Chicago office of Calco Chemical Division of American Cyanamid Co. Mr. Howerton attended Washington & Lee University from which he graduated in 1922 after specializing in chemistry. After a year with the teaching staff of Staunton Military Academy he entered the textile industry.

✦ WALTER MAGEE ANNETTE, manager in New York of Hercules Powder Co., was guest of honor at a dinner June 4 celebrating completion of 40 years in chemical industry. A captain in the Spanish-American war he served as manager of munitions works at Nitro, W. Va., in World War I.

OBITUARIES

✦ ROBERT F. VOGT, chief consulting engineer of the Allis-Chalmers Mfg. Co. since 1937 and an employee of the company for 36 years, died April 17, after a week's illness.

✦ CARY D. WATERS, president of C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., died Saturday, May 9.

✦ ARTHUR A. BACKUS, vice president in charge of production of the United States Industrial Chemicals, Inc., was fatally injured on May 18 when he accidentally fell from a train en route from his home in Stamford, Conn., to New York.

✦ THOMAS GUY WINDES, Winnetka, Ill., chemical engineer and water softening authority, died May 19 in the Evanston Hospital. Mr. Windes was 64 years old. He was formerly with the Illinois Steel Co. and during recent years he has been with the National Aluminate Corp.

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Planned and installed to meet handling needs in your plant, Standard power driven or gravity operated conveyors assure smooth, uninterrupted service 24 hours daily, a full seven days per week—keep materials and parts flowing—fast and sure—from machine to machine—department to department—help maintain the swift tempo of wartime production.
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The steady, irresistible flow of American War Production is what makes it invincible. The flow of the liquids and gases that play such an important part in all modern production, to be effective, must be perfectly controlled. To keep them flowing under perfect control is our job. We have been at it just four years short of a century. During that time we have met and overcome many a problem concerned with the controlled flow of the fluids of industry.

Powell Flush Bottom Tank Valves are specially designed and engineered to meet the demand of the Chemical and Process Industries for valves that can be depended upon for draining metal tanks (with or without steam jackets), glass or vitreous-lined tanks, and autoclaves.

The Powell Flush Bottom Tank Valve shown here is equipped with auxiliary handwheel and patented seat wiper, features that can be furnished on all Flush Bottom Tank Valves, Globe, Angle and "Y" Valves. Rotating the auxiliary handwheel revolves the disc over the seat, an action that balls up any adhering material and clears the seat and disc for tight seating when the main handwheel is used for closing the valve. This valve is available in Acid-resisting Bronzes, Monel Metal, Pure Nickel, various grades of Stainless Steel, Cast Iron and Cast Steel. Can be supplied in all sizes, for various pressures.

POWELL

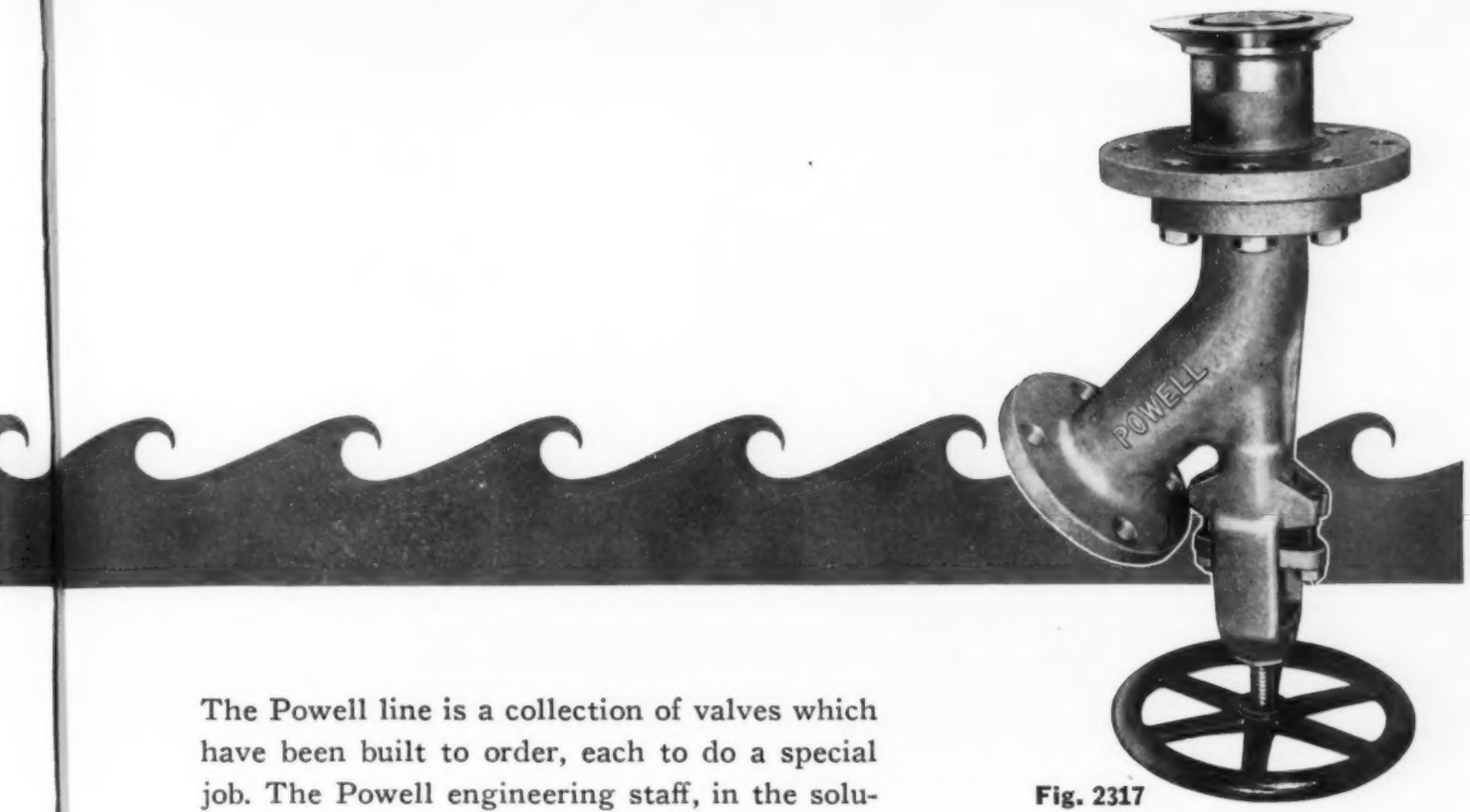


Fig. 2317

The Powell line is a collection of valves which have been built to order, each to do a special job. The Powell engineering staff, in the solution of new problems, year after year, have built up the Powell line valve by valve. Today it covers the full range of industry's needs. Tomorrow it will do the same. For industry's problems are our problems and we are ready and able to work them out. When you think of the liquids and gases of industry, and how to control them, think of Powell.

The Wm. Powell Company

Cincinnati, Ohio

Fig. 2315

Fig. 2317—Powell Flush Bottom Tank Valve designed for attaching to glass or vitreous-lined tank. Has special attaching collar to facilitate adjustment to tank outlet.

Fig. 2315—Powell Flush bottom Tank Valve designed for attaching to metal tank with steam jacket.

These valves are available in bronze, iron, steel, pure metals and special alloys.

In all Powell Flush Bottom Tank Valves the valve proper is one complete unit that easily can be removed from the tank for inspection or regrinding, if necessary.

VALVES

WILSON PULSAFEEDER

For PUMPING

ACIDS

ALL CONCENTRATIONS

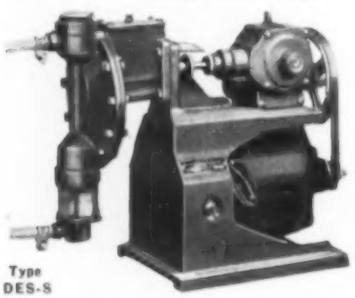
HYDROCARBONS

Capacities from 0 to 360 G.P.H.
Pressures up to 1000 lb/sq."

Positive Displacement Feeding with ISOLATION of Chemical Pumped, from Operating Parts.

PACKING GLANDS ELIMINATED

PULSAFEEDER'S design assures isolation of operating parts from the chemical being pumped. This eliminates such troublesome points as packing gland leakage and diaphragm breakage, and guarantees remarkably accurate feed. The chemical solution is not in contact with the atmosphere at any time, which is important when feeding anhydrous liquid or volatile chemicals. Further, as no contact is made with operating parts, no grease, oil, graphite or other lubricant is in contact with the chemical. Therefore, no contamination of the chemical solution can result.



Type DES-S

To the right is pictured the electric motor driven, manually adjustable feeder. Either plastics or metallic diaphragm head can be furnished. The type of check valves is determined by the characteristics of the solution being pumped.

Type MC-DS-S

Illustrated at the left is a liquid meter controlled PULSAFEEDER which may be driven by either air or water power. The meter is used for the purpose of pacing the PULSAFEEDER. However, only a minute amount of power is taken from the meter and therefore it does not impair accuracy in any way.

CHEMICALS HANDLED

PULSAFEEDERS have been adapted for feeding practically all chemical solutions under high and low pressures. Organic and mineral acids, all concentrations; alkalis, all concentrations; all metal salts, solvents; chlorine compounds; chlorine, etc. Its construction and material vary depending on the particular chemical fed and operating conditions.

WRITE FOR BULLETIN

WILSON CHEMICAL FEEDERS, Inc.
112 WASHINGTON STREET
BUFFALO, N. Y.

NEWS OF PRODUCTS AND MATERIALS

HYDROCARBON WAXES

Three new types of hydrocarbon wax developed by the Phosphate Division of Monsanto Chemical Co. are expected to find uses in improving the stability of candles and other wax articles, as lubricants in specialized high temperature services, in compounding polishes and waxes and as plasticizers in coatings and finishes. Known as Santowax, the three types vary in physical properties, from an oily crystalline material with a melting point of less than 122 deg. to a nearly white crystalline material with a melting point in the neighborhood of 410 deg. F.

WOOD IMPREGNATOR

A special phenolic resin containing a new group of hydrocarbon constituents has been developed by the Synbar Corp. of Wilmington, Del. for use in impregnating of wood. This resin is of an alcohol soluble type and is characterized by an extremely high penetration power that makes it chemical and water resistant. It has been named Iwnal.

SILVER AS A DISINFECTANT

It has long been known that silver, in common with other heavy metals, possesses germicidal properties. Applications have been found not only in connection with water supplies and in the mechanics of preservation of fruits, but also in other industrial applications. According to Handy and Harman of New York much remains to be done in the studies of germicidal and related effects of silver but a great deal of promising research is under way and a bibliography of published information in this field is available through the American Silver Producers' Research Project offices at 82 Fulton St., New York City.

LANOLIN SUBSTITUTE

For industrial purposes lanolin can be replaced in many cases by a substitute known as Sublan, recently introduced by the Glyco Products Co. of Brooklyn. It is made from domestic raw materials which are freely available for civilian use. In appearance it closely resembles lanolin, being a light colored thin paste with a melting point of 55 to 60 deg. C. and a similar surface tack. It is insoluble in water, glycerin and most water-soluble liquids.

Its manufacturers suggest its use as a seal in lines carrying water and water-soluble solutions and as a dressing or finishing and softening material for leather or similar products.

LACQUER INHIBITOR

A corrosion-inhibiting additive for clear lacquers, nitrocellulose solutions, and alcoholic shellacs which eliminates the need for shipping these materials in tin-lined drums, has been announced by the Merrimac Division of Monsanto Chemical Co. It is a solution of an organo-phosphorus compound known as D. P. solution. When used in lacquers in proportions of 0.1 to 1.0 percent, it has been found to give effective protection against corrosion of iron or steel under conditions met in the handling of lacquer shipments.

Its action is ascribed to the fact that it reacts with iron to form an insoluble film. Though of but microscopic thickness, this film is sufficient to afford protection to the surface and in case of breaks it is self-mending by virtue of the very manner in which it is formed.

It is expected that the use of D. P. solution will continue after the current tin shortage because it offers a cost advantage over tin-lining of drums even at pre-shortage prices. Two pounds of tin ordinarily are required to coat the interior of a single 55-gal. drum of the type used for industrial shipments of lacquers.

In addition to inhibiting corrosion, the new solution has demonstrated interesting properties as a flocculating agent for maintaining good suspensions of the flatting agent in flat lacquers. The majority of lacquers contain sufficient flocculating agent introduced through the solvents, nitrocellulose or flatting agent itself, to prevent settling, but it has been found that this condition is assured in almost any lacquer when D. P. solution is used.

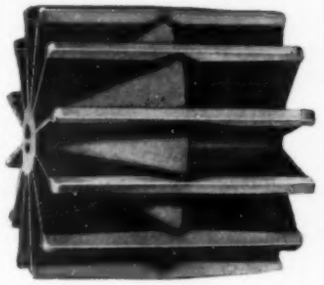
HAND-WIPING SOLVENT

A new hand-wiping safety solvent which is to be marketed as a safety replacement for naphtha, gasoline and kerosene in removing cosmoline out of rifles issued to troops, has recently been developed by the Research and Development Laboratory of the Curran Corp., Malden, Mass. The new solvent is also applicable for wide industrial use as a naphtha substitute for grease cleaning and hand-wiping operations in ordnance factories or shell plants, according to Mr. A. F. Curran, Research Director. It is to be marketed under its blanket trade-mark of GUNK XP-92, to be used as a concentrate and to be diluted with water. The new solvent is described as a unique safety solvent because in spite of its high solvency against mineral oil or dirt, it does not de-oil the skin, has no toxic vapors, no flash or fire point, and leaves no invisible rust preventative film so thin it can not be detected. It is said to quickly lubricate and preserve wet metal surfaces from rust.

CORROSION INHIBITOR

It is said that corrosion may now be inhibited by a recent development of the D. W. Haering & Co.'s research laboratories, Chicago. It is identified as ferri chrom glucosate. The new inhibitor is the ferric salt of quachrom glucosate and introduces a non-oxidizing chromium inhibitor for the first time. It is said to control corrosion in

(*Continued on page* 142)



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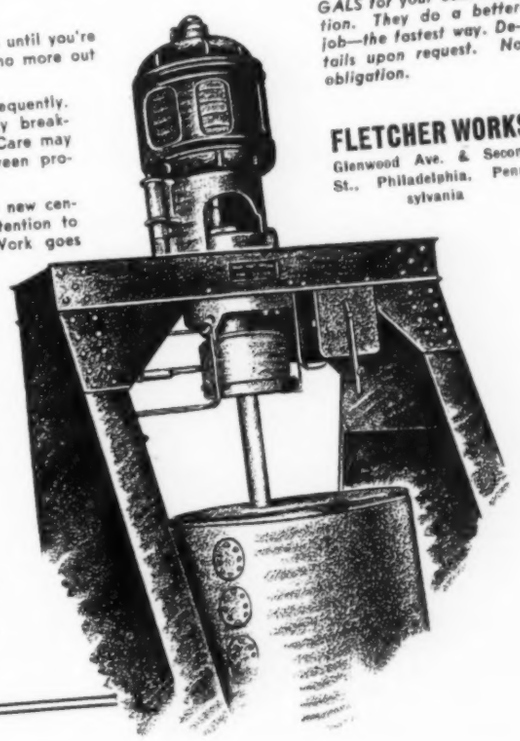

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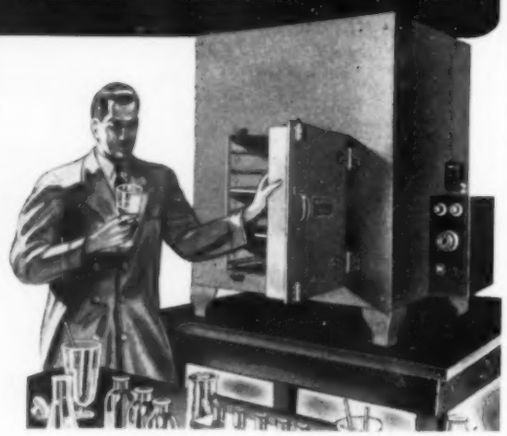

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How to solve heat transfer problems

in the design of chemical engineering, power, heating, and air-conditioning equipment

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Introduction to Heat Transfer

Provides a clear conception of the manner in which heat is transmitted and of the development of the fundamental mathematical expressions that apply to the calculations of heat transfer through clean surfaces. Includes useful reference data, and many numerical illustrations. Complicated mathematics is reduced to a minimum by application of the principles of dimensional analysis.

Gives illustrations of the application of the principles of heat transfer in the design of a feed water heater, a surface condenser, and a fin-tube fan coil, each with complete calculations and in a form to illustrate the way in which it may be necessary to modify or build upon principles when applying them to design problems.

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(*Continued from page* 140)

some applications in concentrations as low as 2 p.p.m. and may be employed in reducing equilibria and at low pH values for corrosion control. It is a colloidal gel which may be used for film formation in process operations by dipping or spraying or may be incorporated in paints or lubricants for corrosion control. It contains very little chromium and is non-irritating to handle. Its use for corrosion applications may reduce chromium consumption for this purpose as much as two decimals at the same time providing more effective control.

BLACKOUT COATING

As protection against the deadly hazard of flying glass during air raids, a new coating for windows is now being offered by Douglas Distributors, Inc., New York, N. Y. The new coating developed by American chemists and known as Protex Shatterproof Black-Out Coating #4, has the property of holding glass splinters together even though the window may be shattered into thousands of fragments. Unlike many blackout coatings, this new formulation which is applied with a brush to the inside of windows washes off easily with water and a cloth. It makes a window absolutely opaque for a period of a year or more under normal conditions. An outside blackout coating is also being offered by the same organization. This coating is sprayed or brushed on the outside of windows forming a dense, flat black finish which is impervious to all weather conditions. It avoids all dangers of reflection, yet can be readily removed at any time with kerosene and a cloth. Known as Protex-Rowe No. 200 outside black-out coating, this material will not cause windows to crack or split under the heat of the sun's rays, thus overcoming one of the major difficulties experienced in defense plants with similar products.

BLACKENING COPPER

Development of a new process called Ebonol "C" for simple, direct, low-temperature chemical blackening of copper and copper alloys, has been completed and is now announced by the Enthone Co., New Haven, Conn. The process involves immersion in a solution of blackening salts operated near the boiling point or from 200 to 212 deg. F. and the blackening is accomplished in from 2 to 10 minutes, depending upon the alloy being blackened. The process is stated to be suitable for blackening copper, beryllium copper, bronze, phosphor bronze and brasses with zinc content of 35 percent or less. High brasses are colored a pleasing chocolate brown. The coating produced is, according to the manufacturer, unique in its properties. The coating is essentially cupric oxide, and being integral with the base metal, it cannot chip or flake. In addition to being jet black, the coating is hard

enough to be buffed and does not have to be lacquered to prevent wear, as is the case with copper sulphide type finishes.

SEALING COMPOUND

Used like putty, just as it comes from the package, Duxseal, a non-hardening adhesive sealing and caulking compound suitable for a wide range of uses, is offered by Johns-Manville, New York, N. Y. It is stated that the compound sticks readily to any clean surface without slumping, flowing or hardening in service, is insoluble in water, unaffected by ordinary gases and condensates and will not hurt the hands. The material is black in color and weighs 100 lb. per cu.ft. It is furnished in 1 lb. and 5 lb. pugs, in cartons of 60 and 12 pugs, respectively. Three additional sealing compounds, similar in appearance and general characteristics, but differing in consistency and certain individual properties, have also been added. Pakseal is designed for service where greater stiffness and rigidity are required; Transolseal, for service requiring resistance to refined oils and Nodrseal for use in food storage and refrigerators.

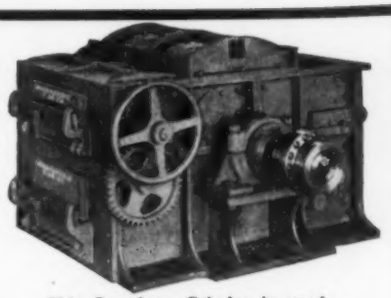
COLLOIDAL GRAPHITE

Dispersions of "dag" colloidal graphite in volatile mineral spirits have been added to standard dispersions available from Acheson Colloids Corp., Port Huron, Mich., according to a company announcement. Outstanding characteristic of the newly standardized dispersion is its unusual flexibility. Carrying the designation of series type 2400, they are miscible with petroleum products and are of special value for use where a dry film of graphite is desired since the carrier is easily and quickly evaporated. They are thus particularly suitable for lubrication of mechanisms operating at high temperatures or where permanent or semi-permanent lubrication is to be provided by the colloidal graphite. Among major uses of the mineral spirits dispersion in addition to dry film lubrication, is in connection with lubrication of stamping dies, clutch plates and the colloidal graphite impregnation of fabrics. The readily available carrier has a 400 deg. F. end point, thus being superior to kerosene type dispersions as to rate of evaporation. Non-toxic, the dispersions are available as concentrates.

DYNAMITE

A new cartridge for seismograph dynamite which will provide a strong, rigid column and make unnecessary stringing, lathing, taping and pegging commonly used in loading a hole, has been developed by the Explosives Department of Hercules Powder Co., Wilmington, Del. The cartridge known as Spiralok consists of dynamite packed in a strong paper shell equipped with a spiral thread. This shell screws into a stout spiral-grooved sleeve. Each cartridge is packed in its own sleeve of the same length. In loading, a sleeve

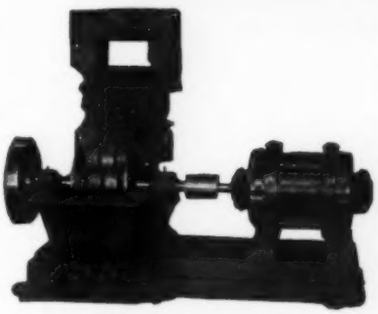
Each one individually built to give MOST Economical Crushing and Grinding Results..



This American Grinder is used for grinding glass and tank cullet, salt briquettes, sinter, skimmings, limestone, gypsum, oyster shells, phosphate rocks, etc.

AMERICAN

CRUSHERS AND GRINDERS



This Laboratory Mill (Ring or Hammer) is used for the reduction of materials for the laboratory and incorporates many features of the larger units. Write for special bulletin.

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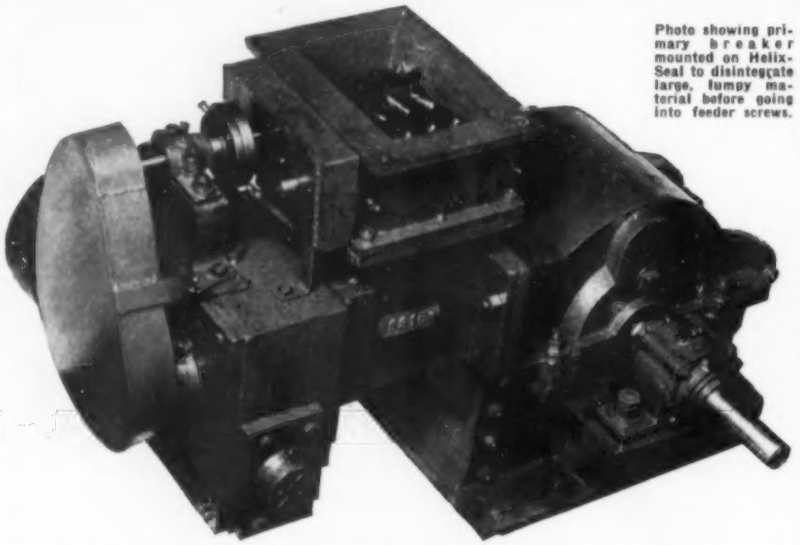

Photo showing primary breaker mounted on Helix-Seal to disintegrate large, lumpy material before going into feeder screws.

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THE WILLIAMS HELIX-SEAL PULVERIZER

FOR FINE GRINDING • • • 100 TO 325 MESH WITHOUT OUTSIDE SEPARATION

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• The Helix-Seal Mill grinds extremely fine without the aid of outside separation. This is largely due to the long grinding surface, adjustable grinding parts and high speed of the hammers. Many materials ground to 325 mesh and 100 to 200 mesh products are common on more difficult materials.

Due to the screw feeder which acts both as a feeder and seal, sealing the intake opening against the inrush of air, no air is sucked into the machine and consequently there is no resulting dust carrying draft expelled from the discharge. Built in nine standard sizes—capacities 200 pounds per hour and up.

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PATENT CRUSHERS GRINDERS SHREDDERS

is screwed over the two halves of adjacent cartridges until they butt together. A series of these cartridges thus joined provides a complete seismograph shot in a rigid column. The new cartridge will save loading time, reduce operating costs and lost and broken charges and make loading the charge easier, the company says.

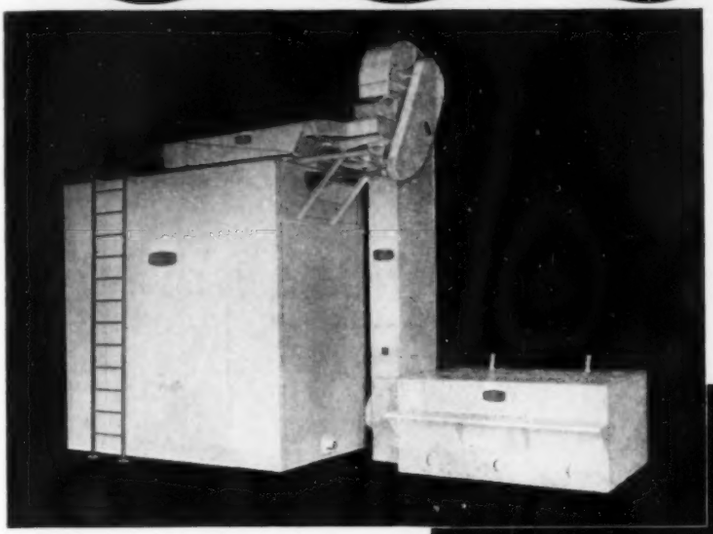
SPOTLIGHTING

Three-dimensional seeing was first announced at the National Convention of Illuminating Engineering Society by the Finishes Division of the Fabrics and Finishes Department of the du Pont company. It is a new method of improving industrial seeing and working conditions by spotlighting the immediate working surfaces of machinery and concentrating attention on the work through contrasts in color and brightness. This is done essentially through the correct combination of color and light so as to produce stainless full vision for machine operators and thus aid in reducing personal injury hazards, increasing production, etc. It is not intended that color be substituted for mechanical guarding and personal protective equipment but rather that it be used to indicate hazardous locations. The application of spotlight buff around the working area of the machine will: (1) Identify moving parts or danger zones, (2) effect a maximum amount of light on the working area, (3) provide proper contrast between the working background of the machine area and the material being processed or tooled, (4) eliminate shadows on the working plane. The body of the machinery should be finished with horizon gray in order to reflect an amount of light which in the vicinity of the employee's operations will be conducive to good seeing conditions. It is suggested in order to determine the effectiveness of spotlighting that several machines in a plant which are considered hazardous be refinished according to directions.

SEALING COMPOUND

The development of a new sealing compound especially designed to seal joints and seams in aluminum construction as well as providing good adhesion to synthetic glass with no effect on the latter material at any working temperature has been announced by the Presstite Engineering Co., St. Louis. It is particularly suitable for sealing synthetic glass turrets and gunners' bays in military aircraft. Joints sealed with this compound are tight for air, water, 100-octane gasoline, aircraft fuel and motor oil. It will remain flexible and not lose its adhesion at extremely low temperatures. The sealer is compounded without volatile solvents and is furnished in the form of an extruded ribbon with a cloth backing to facilitate application. The manufacturer claims it is non-corrosive, non-drying, non-hydroscopic, non-polymerizing, and permanently elastic. It is available in widths from .625 in. to 2.0 in. and from .020 in. to .125 in. thickness.

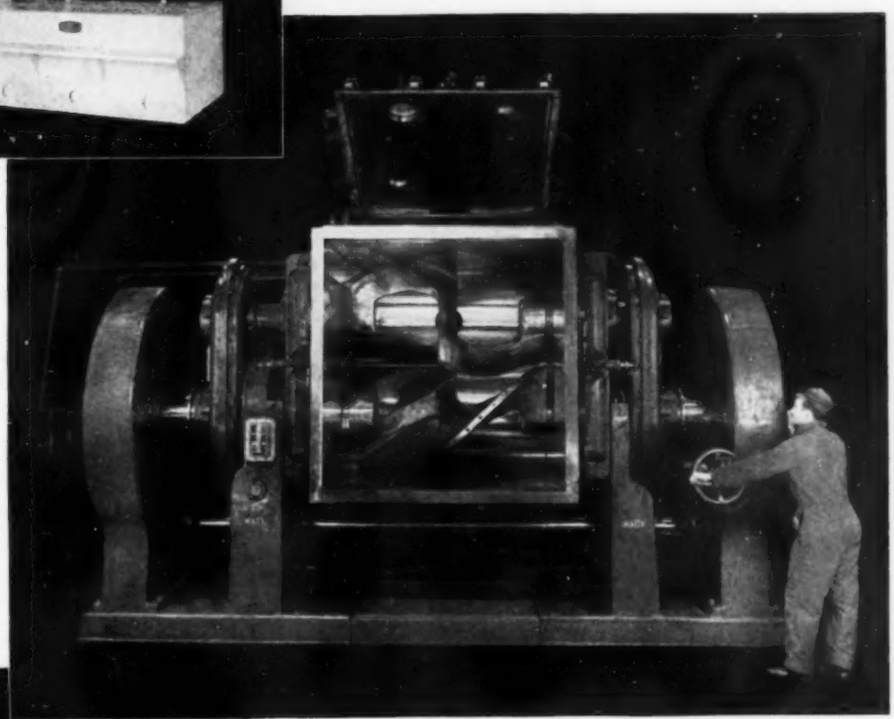
READ HELPS SPEED THE FLOW OF WAR CHEMICALS

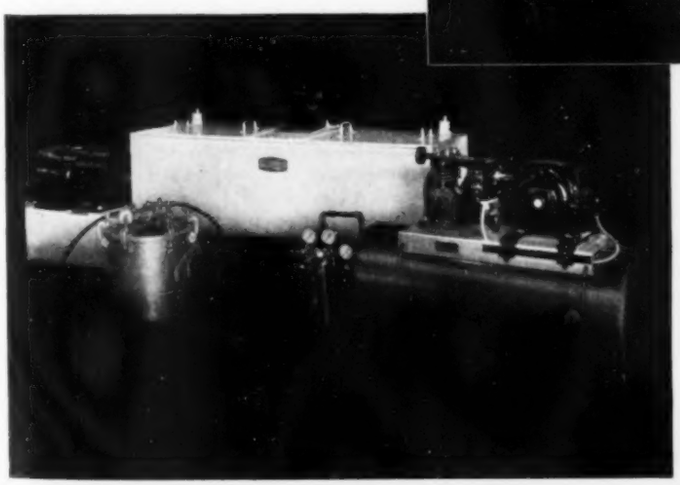


READCO chemical process equipment is individually designed to improve the production cycle by efficient mixing, blending and handling of chemical materials with minimum material loss and contamination. In addition to this complete line of process equipment for laboratory, pilot plant and commercial use, Readco is providing powder mixers, amatol preheaters, howitzers, torpedo parts, et al., in vast numbers under both prime contract and sub contract *for the duration.*

▲ Readco Material Handling Equipment is designed to coordinate all steps in the efficient flow of powdered or granular material in any process without loss of material. Systems may be provided for continuous or batch operation.

Readco Single Packing Gland Vacuum Mixers are designed for operation under high vacuum, enabling the evaporation of moisture or solvents from materials being mixed at temperatures below their atmospheric boiling points. These machines are adapted for materials requiring treatment in inert atmosphere or under elevated pressures. Single packing gland construction eliminates possibility of contamination and minimizes maintenance. ▶





◀ Readco Spray Blenders are designed for thoroughly incorporating liquids or emulsions into granulations and powders. Into each cover is built a unique spray atomizing attachment which insures positive disbursement of liquid, injected at exact predetermined quantities and rate of flow, leaving finished batch free of lumps or excessively moistened particles.

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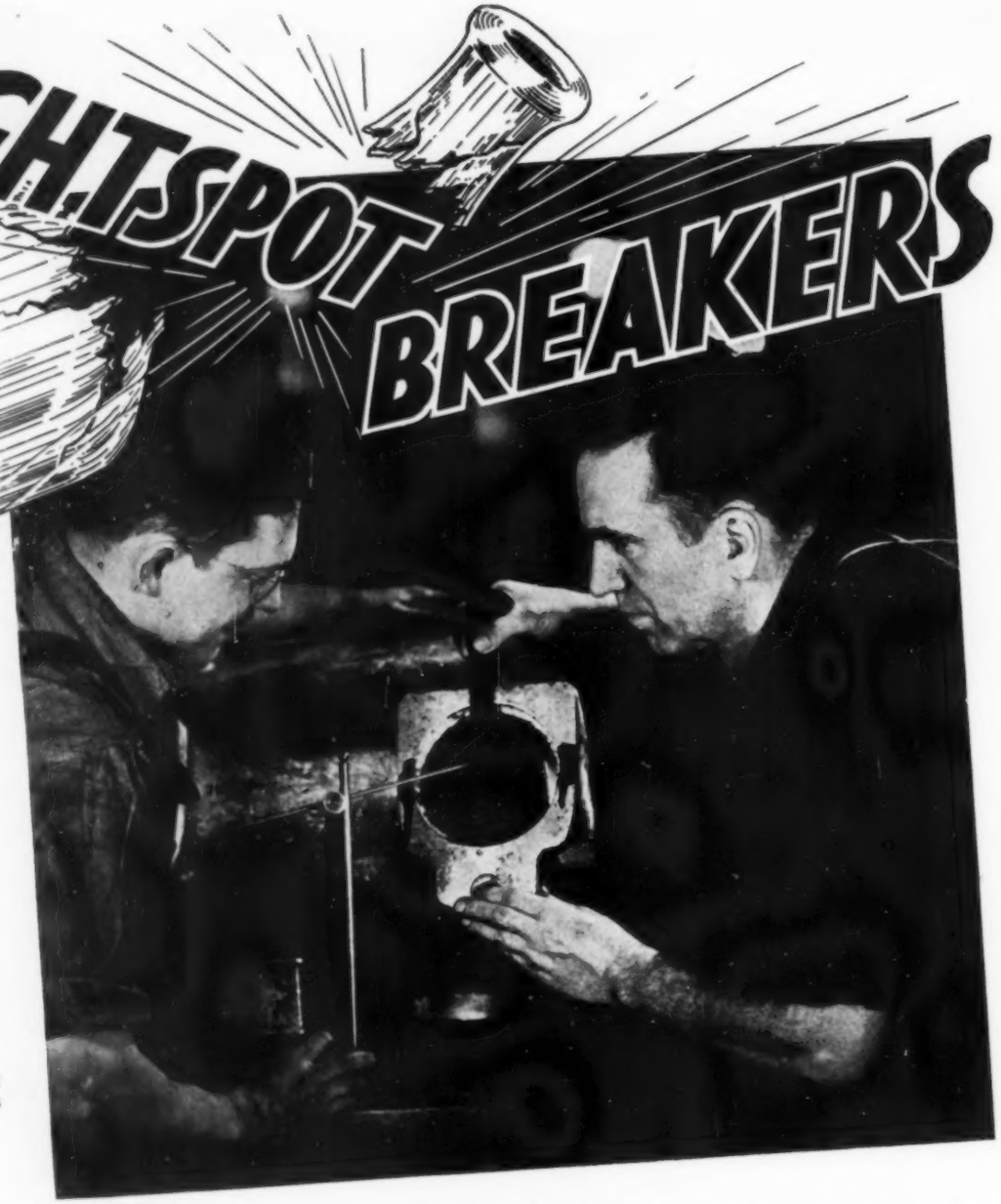
TIGHTSPOT BREAKERS



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American Society for Testing Materials Holds Annual Meeting

CHEM & MET NEWS OF MEETINGS & CONVENTIONS

AMERICAN SOCIETY FOR TESTING MATERIALS MEETS DURING JUNE

MORE THAN 100 technical papers and reports are scheduled for presentation at the 45th annual meeting of the American Society for Testing Materials to be held at Chalfonte-Haddon Hall, Atlantic City, June 22-26. During this week there will be also more than 150 meetings of technical committees. Some 18 separate official technical sessions will be scheduled at which technical reports and papers will be presented.

Two outstanding technical features are the Symposium on Radiography and a discussion on Solvent Action of Water Vapor at High Temperature and Pressure. Other subjects included in the technical program cover the field of ferrous and non-ferrous metals, cement, concrete and mortars, statistical study on methods for analysis of coal and coke, method of control of liquid starch-base adhesives, mechanical tests on cellulose acetates, acid and alkali resistance of plastic materials, ignition point of plastic materials, and others.

Dr. G. E. F. Lundell will present his presidential address on the subject "Chemical Analysis" on which he is an outstanding authority. The 17th Edgar Marburg lecture, also scheduled for Wednesday, will be delivered by Dr. Graham Edgar, Ethyl Gasoline Corp., on the subject "Gasoline—Past, Present and Future."

TEXTILE CHEMISTS MAKE PLANS FOR ANNUAL FALL MEETING

ANNUAL MEETING of the American Association of Textile Chemists and Colorists will be held in Atlantic City, October 8. Heretofore the technical program for these meetings has consisted chiefly of the presentation of prepared addresses by speakers prominent in the textile and dyestuff industries. This year an innovation will be tried out since the theme of the entire meeting will be textile chemists' contribution to the war effort. It is felt that more can be accomplished through an exchange of opinions and experiences drawn from all the textile centers of the country than by prepared addresses.

A chairman will be appointed for each group and the opportunity freely offered to each member to present his problem. The groups will be kept small and intimate. To promote the free exchange of experiences, no stenographer will be present and the proceedings will not be published.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS AWARDS STUDENT PRIZES

CHARLES C. NEAS, a senior student at the University of Illinois, was named recipient of the A. McLaren White national student chemical engineering award at the 34th semi-annual meeting of the American Institute of Chemical Engineers in Boston. The award was presented by S. D. Kirkpatrick, president of the Institute. Second and third prizes, respectively, went to Gilbert R. Shockley of the Missouri School of Mines and Metallurgy, and Karl H. Rothe of Copper Union Institute of Technology, New York City. Honorable mentions were received by Harold R. Frisbie of Oregon State College, Robert E. Deatz of Kansas State College and Herbert Kress of Pratt Institute.

According to Mr. Kirkpatrick, the awards are made annually to students in the United States who submit the most satisfactory solutions to an intricate chemical engineering problem prepared by the Institute. The problem this year involved the design of an industrial plant for the manufacture of aniline. Thirty-two contestants survived the preliminary elimination and were entered in the final competition.

NATIONAL CHEMICAL EXPOSITION IN CHICAGO MAKES PLANS

THE 1942 NATIONAL Chemical Exposition at the Stevens Hotel, Chicago, November 17-22, will be twice as large in floor area as the first show. More than 40,000 sq.ft. have been made available. This is the second such exposition sponsored by the Chicago Section of the American Chemical Society. The National Industrial Chemical Conference will be held in conjunction with the Exposition.

The Advisory Committee, working closely with the sponsors, is composed of Bruce K. Brown, J. V. N. Dorr, Willard H. Dow, Gustav Egloff, Otto Eisenschiml, Harry N. Holmes, Harrison E. Howe, Ward V. Evans, William Lloyd Evans, S. D. Kirkpatrick, H. R. Kraybill, A. H. Mellinger, George W. Merck, Thomas Midgley, Jr., Carl S. Miner, Walter J. Murphy, Harry McCormack, Charles L. Parsons, H. I. Schlesinger, N. A. Shepard, C. R. Wagner, E. R. Weidlein, Frank C. Whitmore and E. C. Williams.

Marcus W. Hinson is show manager, with headquarters at 110 N. Franklin St., Chicago, Ill.

ELECTROCHEMISTS TO MEET NEXT OCTOBER

HEADQUARTERS FOR the Fall meeting of the Electrochemical Society will be the Hotel Statler in Detroit, and the meeting is now scheduled for October 7-10. Mr. Carl E. Heussner, Materials Engineer of the Chrysler Corporation, is General Chairman of the local committee.

There will be two main scientific-technical sessions: one devoted to "Theoretical Electrochemistry" in charge of Prof. Malcolm Dole, and the other devoted to "Modern Trends in Electroplating" in Charge of Dr. Harold J. Read. There will be one or two other informal sessions under the auspices of the Electrodeposition Division.

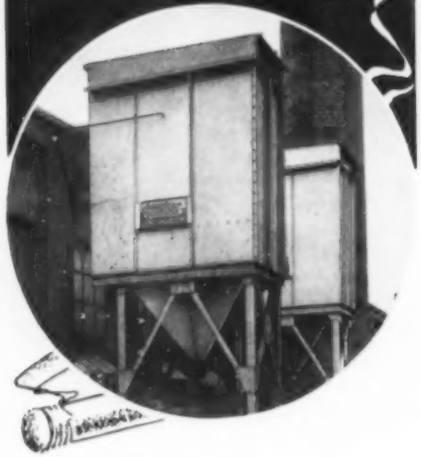
The "Theoretical" session has attracted nation-wide attention. Among those planning to participate are Prof. P. Debye of Cornell University, Prof. A. L. Ferguson of the University of Michigan, Dr. Arthur A. Frost of Northwestern University, Dr. Kasimir Fajans of the University of Michigan, Dr. H. A. Laitinen of the University

CALENDAR

JUNE 22-26	**American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.**
SEPT. 7-11	**American Chemical Society, 104th meeting, Buffalo, N. Y.**
SEPT. 29-30	**Technical Association of the Pulp and Paper Industry, Statler Hotel, Boston, Mass.**
NOV. 9-13	**American Petroleum Institute, 23rd annual meeting, Stevens Hotel, Chicago, Ill.**
NOV. 16-18	**American Institute of Chemical Engineers, 35th annual meeting, Netherland Plaza, Cincinnati, Ohio.**

TRAPPED!

DUST PARTICLES SO SMALL *that* 300 BILLION WEIGH LESS *than* YOUR FAVORITE CIGARETTE



HARMFUL dust particles range between 0 and 20 microns in size. Just how small is that? According to eminent authorities it takes in the neighborhood of 300 billion of these particles to weigh one gram, or roughly the weight of a cigarette!

To control particles as infinitely small as these requires a dust collector of exceptionally high efficiency. But, small as they are, such particles cannot escape the arresting action of "Dustube" cloth bag type dust collectors.

Results in hundreds of applications prove that "Dustubes" meet the most exacting requirements. *Efficiency by weight:* 98% and more; *efficiency by dust count:* discharged air shows less than ten million particles per cubic foot from 2 to 10 microns in size, (as determined by the impinger method).

Write for new Dustube Catalog No. 62.

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DUSTUBE
DUST COLLECTORS

of Illinois, Dr. B. Geekie Cobb of Toronto, and Dr. Frank K. Savage of the C. G. Conn Co.

PLASTICS SOCIETY RE-ELECTS KINNEAR

AT ITS ANNUAL convention, held in the Homestead, Hot Springs, Va., last May, the Society of Plastics Industry re-elected Ronald Kinnear, of the Niagara Insul-Bake Company, Albany, N. Y., president of the Society. Elmer C. Maywald, of the Chicago Molded Products Co., was elected vice president.

AMERICAN INSTITUTE OF CHEMISTS ELECTS EGLOFF

AT ITS MAY meeting in Atlantic City, the American Institute of Chemists elected Gustav Egloff, research director for the Universal Oil Products Corp., Chicago, president for the coming year. Dr. Donald Price, technical director for National Oil Products Co., Harrison, N. J., was elected vice-president, while Howard F. Neiman, patent attorney, New York, was elected secretary. Mr. Walter J. Murphy, editor of *Chemical Industries*, was elected treasurer.

Councillors include Dr. Henry G. Knight, chief of the Bureau of Agricultural Chemistry and Engineering of the Department of Agriculture, Washington; Dr. Foster D. Snell, president of Foster D. Snell, Inc., Brooklyn; and Dr. Donald G. Andrews, Professor of Chemistry of Johns Hopkins University, Baltimore.

WAR PRODUCTION EDITION OF NATIONAL METAL EXPOSITION FOR OCTOBER

THE WAR PRODUCTION Edition of the National Metal Exposition will be held in conjunction with the National Metal Congress in Cleveland's Public Auditorium during the week of October 12-16. Due to governmental and war plant space needs in Detroit, the scheduled event has been moved from that city to Cleveland.

The 1942 War Production Edition of the National Metal Exposition will be a 100 percent educational, demonstration clinic devoted to increased production, planning, engineering, improvement of materials, job training, conservation, substitution and maintenance. Exhibits, catalogs, blueprints, personal conferences and group discussions will be featured.

In addition to the American Society of Metals, three other technical societies will cooperate in the Exposition as well as the National Metal Congress. They are the American Welding Society, the Wire Association and the Iron and Steel Division and Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers.

TAPPI TO MEET IN BOSTON DURING SEPTEMBER

THE 27TH FALL meeting of the Technical Association of the Pulp and Paper Industry will be held in Boston, Mass., from September 30 to October 1, inclusive. Convention headquarters will be established at the Hotel Statler. All effort will be made to utilize this opportunity toward defining, discussing and finding solutions for the problems confronting the industry as a part of the country's Victory effort. Serious cooperative planning for most efficient service will be paramount. National headquarters of the Association are located at 122 E. 42nd St., New York, N. Y.

SELECTIONS FROM CONVENTION PAPERS

HEAT TRANSFER BY CONVECTION IN ANNULAR SPACES

HEAT TRANSFER coefficients have been obtained experimentally for fluids flowing in turbulent flow in concentric circular annuli. The investigation covers heat transfer from the inner tube of the annulus at three ratios of outer to inner tube diameters, namely 1.65, 2.45 and 17, using water and air over a temperature range of 80°F. to 180°F., and with Reynolds' numbers varying from 12,000 to 220,000. Heat transfer from the outer tube to the annular space was studied for a diameter ratio of 1.85.

The experimental results indicate that it is satisfactory to use the well-known Dittus-Boelter or Colburn equations for heat transfer in tubes for the case of the outer annulus surface, provided an "equivalent" diameter is used equal to 4 times the hydraulic radius of the annulus. The experimental results for the heat transfer from the inner tube to the annulus may be correlated by the same equations providing the constant in the equations is modified from 0.023 to

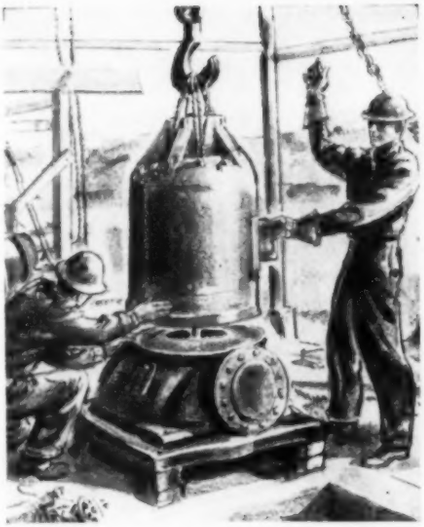
$$0.020 \left(\frac{D_1}{D_2}\right)^{0.53},$$

where D_1 is the diameter of the outer tube and D_2 the diameter of the inner tube. On the assumption that the relative skin frictions on the two surfaces is the same for turbulent as for viscous flow, the constant is predicted to be

$$0.023 \left[\frac{2\,1\,n\,\frac{D_1}{D_2} - \left(\frac{D_1}{D_2}\right)^2 + 1}{2\left(\frac{D_1}{D_2}\right) 1\,n\,\frac{D_1}{D_2} - \frac{D_1}{D_2} + \frac{D_2}{D_1}} \right]$$

The constant calculated from this more elaborate equation agrees with the data within the limits of experimental error. It is recommended that this equation be used in preference to the more simple form.

C. C. Monrad, Carnegie Institute of Technology, and J. F. Pelton, Linde Air Products Co., Tonawanda, N. Y., before the American Institute of Chemical Engineers, Boston, Mass., May 11-13, 1942.



Completed On Time!

"Never have so many, owed so much, to so few!"

That brilliant statement made by Britain's Winston Churchill can be applied to a case in our own country.

Today, millions of soldiers, sailors and marines are being supplied with an abundance of safe water from Layne built Well Water Systems. The Armed Forces can thank less than two thousand Layne Organization employees. In an amazingly short period of time, they undertook—and *completed on time*—the most gigantic Well Water System building task ever accomplished in this, or in any other country. These widely experienced men located water bearing sands, drilled wells in almost every type of earth formation and set tons of casing. Furthermore they built the pumps, made installations and placed their water systems in operation—producing hundreds of millions of gallons of water daily.

Such outstanding service, performed without delay or failure, has created a brilliant chapter in the long and successful career of the Layne Organization. No greater commendation for ability, speed and efficiency could be offered.

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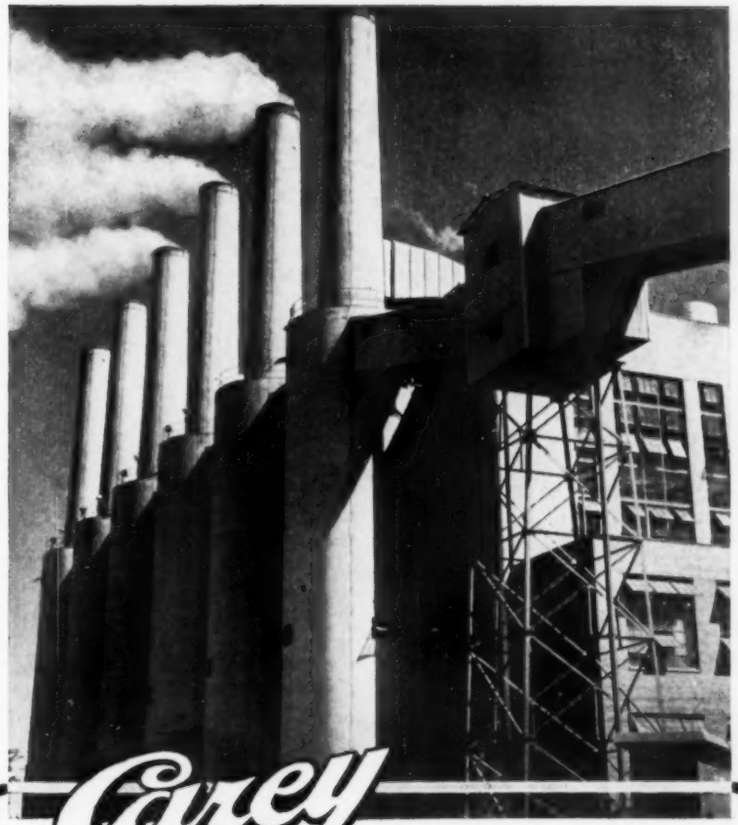

Carey HEAT INSULATIONS

DRAFTED FOR WAR SERVICE *in largest* POWDER PLANT

In one of the nation's mammoth powder plants, CAREY Heat Insulations are rendering vital service—aiding in the efficient and economical production of explosives for our armed services.

The insulation requirements for this project included many miles of pipe covering for outside lines ranging in size from ½" to 30" in diameter, and additional miles of insulation for inside lines. Apart from the piping, numerous other pieces of processing equipment—stills, vapor columns, condensers, concentrators, etc.—required adequate insulation.

In hundreds of plants throughout the nation, CAREY Insulations are helping industry win the battle of production. Their high efficiency; their ability to withstand extreme temperatures and pressures; their toughness and durability; their variety, covering all service conditions; are qualities known to leading engineers the country over. For details, address Dept. 15.

Whatever your insulation requirements, you're SAFE *with* CAREY. *A nation-wide organization is at your service.*

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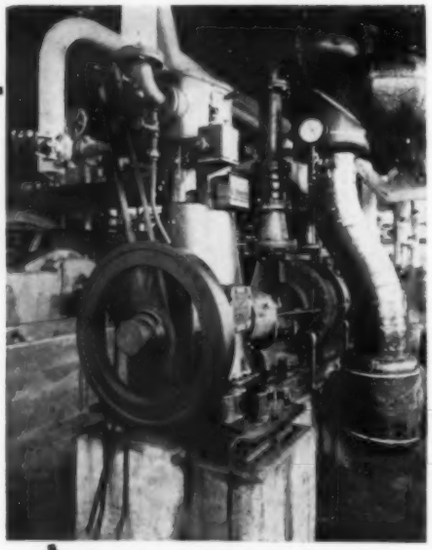
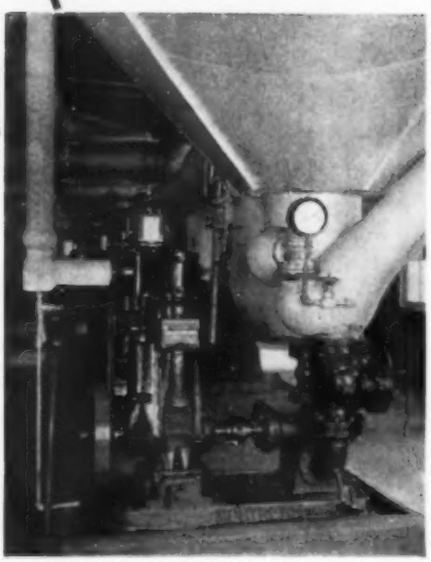
STEAM FOR POWER FOR PROCESSING

...often combined to the best advantage in the modern TROY-ENGBERG STEAM ENGINE





THE common knowledge that steam has both power and heat should automatically lead every processing plant to consider the use of the modern steam engine for driving pumps, fans, blowers, generators, compressors, cookers, and dryers. In many cases, the modern steam engine can deliver power at the lowest rate and provide maximum heat units for processing or heating.

That Troy-Engberg Steam Engines are used today in many process plants is due to the fact that they are best from the standpoint of power cost, character of drive, and heat content of exhaust. That they are utterly dependable is no secondary matter, either.

No doubt you are too busy now to look over your power setup and we're pretty busy turning out hundreds of generating sets (engines hooked up to generators) for the Liberty Ships. But the time will come when you can consider such questions and when we'll be in a position to serve you. Keep the Troy-Engberg Steam Engine in mind. It's a real modern drive.

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EXTRACTION OF OIL FROM A POROUS SOLID

EXPERIMENTAL DATA were collected on semi-batch and continuous, counter-current extractions of soybean oil from porous plates, using perchlorethylene and a carbon tetrachloride-ethylene dichloride mixture as solvents. The liquid-film resistance was found to be negligible as compared with the resistance to diffusion within the solid. The extraction period was divided into two stages: an initial stage, characterized by a substantially constant center-line concentration within the plates; and a final stage, characterized by a falling center-line concentration within the plates. A correlation of the semi-batch extraction data produced the following rate of extraction equations.

Initial extraction stage:

$$\frac{dW}{A\,d\theta} = \frac{25.15 \times 10^{-4}}{(\mu_o \mu_s)\,0.565} \frac{(X_1 - X_E)}{(X_1 - X)} (C_S - C_L)$$

Final extraction stage:

$$\frac{dW}{A\,d\theta} = \frac{36.15 \times 10^{-4}}{(\mu_o \mu_s)\,0.348} (C_S - C_L)$$

Extraction periods for continuous, counter-current extractions were predicted by means of suitable integrations of these equations, and were then checked experimentally. The discrepancy was less than 6 percent in all cases. The proposed extraction mechanism was further checked by extractions of porous plates initially saturated with oil-solvent solutions of different concentrations.

D. F. Boucher, E. I. duPont de Nemours & Co., Wilmington, Del., and J. C. Brier, Univ. of Michigan, Ann Arbor, before the American Institute of Chemical Engineers, Boston, Mass., May 11–13, 1942.

HYDROCHLORIC ACID FOR INHIBITING CORROSION OF STAINLESS STEEL

TREATMENT of 18-8 chromium-nickel steel with HNO_3 improves the appearance and corrosion resistance of the alloy. The improvement is sufficiently good so that this additional final treatment of the surface is an accepted step in the commercial preparation of stainless steel. However, it has been shown that the improvement is not unique to oxidizing acids because a surface treatment with hydrochloric acid, 3 N to 12.5 N containing an inhibitor, accomplishes much the same thing.

Results of the experiments show that an oxidizing environment is not necessary to "passivate" 18-8 stainless steel. Oxidizing environments include oxidizing reagents such as nitric or chromic acids or treatment by anodic polarization. The result also suggests that a mechanism of passivation by HNO_3 based on increase in thickness of a

• • •

"We can win the battle of production only if every member of every American industry cooperates with his competitors and his Government as effectively on a voluntary basis as industries in the Axis countries do under compulsion."

supposed protective oxide film on stainless steel is not probable. Hydrochloric acid has a marked tendency to react with stainless steel oxide, whether or not an inhibitor is present. However, inhibitors in hydrochloric acid, whatever their chemical composition, appear to decrease the reaction rate of acid with metals by absorbing on the clean metal surface.

A commercial pickling inhibitor and quinolin ethiodide were the inhibitors tried. Corrosion resistance was determined by exposure to 10 percent ferric chloride, noting weight loss and number of pits. The number of pits per specimen approximately paralleled the weight loss.

Improvement in corrosion resistance was better for specimens surface-treated with the higher concentrations of acid, except for 12.5 *N* hydrochloric acid. The latter produces the same or lower resistance to pitting as compared with 9 *N* acid. Improvement upon using hydrochloric acid plus quinolin ethiodide was less but comparable with the improvement from nitric acid.

H. H. Uhlig and E. M. Wallace, Research Laboratory, General Electric Co., and Massachusetts Institute of Technology, respectively, before the Electrochemical Society, Nashville, Tenn., April 15-18, 1942.

INSECTICIDES FOR CONTROL OF COTTON INSECTS

LARGE AMOUNTS of insecticides must be applied annually to growing cotton to protect it against the ravages of destructive insects and fungi. The following materials are used annually as insecticides and fungicides to protect the cotton crop of the nation:

	Lb.
Stomach poisons:	
Calcium arsenate (including London purple)	40,000,000
Paris green	500,000
Lead arsenate	100,000
White arsenic	100,000
Fungicides:	
Organic mercury seed disinfectants	600,000
Contact poisons:	
Rotenone dusts (1% rotenone)	250,000
Sulphur dusts	20,000,000
Nicotine sulphate solution (40% nicotine)	32,000

R. C. Roark, Division of Insecticide Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C., before the American Chemical Society, Memphis, Tenn., April 20–24, 1942.

RADIANT HEAT TRANSMISSION

THE RATE of transfer of energy as friction and heat and the transfer of material are closely related to the measurements of turbulence in flowing streams. Data on these processes have been collected and correlated for annuli on the basis of the "*j* factors" of Chilton and Colburn. The most suitable value of the Reynolds' number to measure turbulence in annuli is believed to be one of whose equivalent diameter factor is the difference of the two annular diameters, $(d_2 - d_1)$.

With laminar flow, if the ratio of inner to outer diameter of an annulus is between 0.85 and 1.0, the annulus is

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THE *Only* ALLOY FOUNDRY WITH *All* THESE FACILITIES

- Laboratory control over raw materials and finished products.
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- Heat treating of castings up to six feet in size.
- Machine shop . . . specially equipped for finishing stainless steel.
- Castings furnished rough, polished or fully machined . . . one ounce to two tons.
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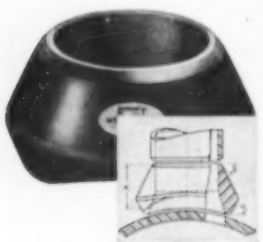
THREDOLETS
. . . Welded Outlets for Piping . . .

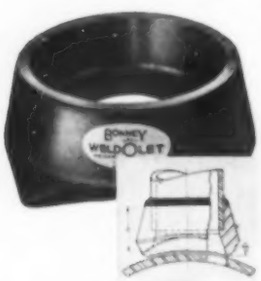
Any One or All 3 Will Make Any Right-Angle Welded Branch Pipe Outlet

TEES, Crosses, Side Outlets, Side Outlets and Crosses or Double Crosses . . . any one or all can be made with Bonney WeldOlets, ThredOlets or Socket-End WeldOlets.



WELDOLET

THREDOLET



Socket-End WELDOLET

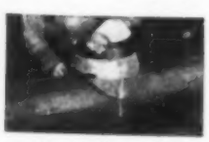
Every branch pipe outlet made with a WeldOlet, ThredOlet or Socket-End WeldOlet will provide a leakproof junction of full pipe strength that reduces friction and turbulence to a minimum.

No templets are required for cutting the hole in the main pipe . . . no complicated forming or fitting is necessary . . . alignment of the main and branch pipes is simplified. The position of the outlet is selected and the WeldOlet, ThredOlet or Socket-End WeldOlet welded in place . . . the hole in the main pipe, in most cases, being made after the fitting is installed.

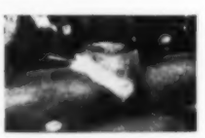
Bonney WeldOlets, ThredOlets and Socket-End WeldOlets are stock fittings of drop forged steel with outlets from ¼" to 12". On special order they can be furnished in sizes up to 24" x 24". To meet special conditions they can also be supplied in wrought iron, Toncan iron, brass, Monel, Everdur, etc. They are adaptable to every type of piping system and for all commonly used pressures and temperatures.

Your local distributor will be glad to give you complete information or write for Bulletin WT29 describing all their advantages.

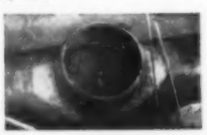
EASILY INSTALLED



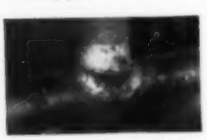
Mark center lines and tack the fittings into place.



Then weld the fitting to the main pipe.



Remove the button which will also permit inspection of the inside of the joint.



Then attach the branch pipe.

Bulletin WT29—20 pages packed with information and data on advantages of WeldOlets, ThredOlets and Socket-End WeldOlets in all types of piping installations. Write for your copy NOW.

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FORGED FITTINGS DIVISION
ALLENTOWN, PA.

best regarded as two parallel plates. If transfer takes place at both inner and outer walls of the annulus, the value of j may be computed without serious error as

$$\frac{12\,\mu}{(d_2 - d_1)\,u\rho}$$

for both the above case and for all other annuli except those having values of the ratio of inner to outer diameter below 0.05.

With turbulent flow, if transfer occurs at one wall only, the values of j vary with the ratio of inner to outer wall diameters, the values increasing with the ratio when transfer occurs on the inner wall, and decreasing when transfer occurs on the outer wall. Data at hand were insufficient to establish reliable equations for these cases. For cases of transfer from both walls in turbulent flow, the values of j do not vary with the diameter ratio and are equal to the values for a round pipe whose diameter is equal to the difference of the annular diameters.

J. H. Wiegand, E. I. duPont de Nemours & Co., Wilmington, Del., and E. M. Baker, Univ. of Michigan, Ann Arbor, before the American Institute of Chemical Engineers, Boston, Mass., May 11–13, 1942.

MANUFACTURE OF LEAD STYPHNATE DETONATOR

FIRST OPERATIONS in the production of lead styphnate are sulphonation and nitration of resorcinol in lead-lined jacketed steel vessels with lead-covered stirrers. The resorcinol is previously crushed in small rotary tooth crushers to a maximum size of ⅛ in. Sulphuric acid is first run into the nitrator, the stirring gear started up and steam turned into the jacket, since the sulphonation of resorcinol is carried out at about 90 deg. C. Resorcinol is then added by means of a funnel which goes to the bottom of the nitrator. When sulphonation is completed, cold water at about 8 deg. C. is turned into the jacket and the charge is cooled to 33 deg. C. before nitration is commenced. The resultant charge, a dark colored mass containing about 48 lb. styphnic acid, is run into a vessel for separation.

Styphnic acid powder is floated to the top of the refuse acid and held there by gas bubbles evolved during the process. The charge stands overnight. The refuse acid is then run off and the styphnic acid is ladled out into an aluminum tub, washed in an earthenware vessel, and then transferred to an earthenware vacuum filter for drying. Chemically, styphnic acid is 2, 4, 6,—trinitroresorcinol.

Precipitation of lead styphnate is carried out in stainless steel tilting vessels fitted with water jackets. Hot and cold water are provided, as the actual precipitation is done at about 50 deg. C. Precipitation is carried out behind a concrete wall 2 ft. thick and all controls to the vessel are worked from outside this wall.

Styphnic acid is added to a solution of MgO in an earthenware vessel fitted with stirring gear. This forms mag-

nesium styphnate, which is run down to a second vessel and diluted to 5 percent strength. This solution is run into the precipitating vessel and the hot water turned into the jacket. Lead nitrate solution is added very slowly, and stirring and heating are continued until reaction is complete. The charge is then cooled to 30 deg. C. and tipped into a filter cloth held in a stainless steel frame below the pot. The resultant charge of about 10 lb. of lead styphnate receives its final washing and a partial drying in a vacuum filter of the same type as that used for drying styphnic acid.

Lead styphnate is then placed in racks and dried by hot air at 45 deg. C. maximum for approximately a day. Prior to this drying, it is sprayed with elemi gum to improve its waterproof qualities. The dry powder is clipped to an aluminum scoop over the sieve. The operator retires behind a bank and tips the chute by means of a lever. The sieved powder is held in a leather funnel fixed below the sieve, and from this it is run into paper or rubber containers.

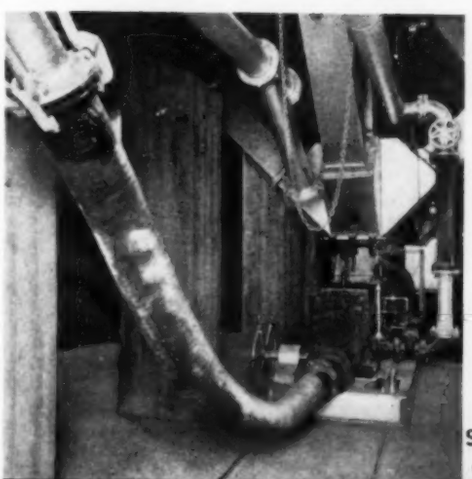
The atmosphere in the lead styphnate magazine is kept at 100 percent humidity by means of a hot-water trough since lead styphnate in a dry atmosphere readily acquires an electrostatic charge. However, the danger is static electricity from the workers themselves. This has been overcome by spring loading all doors and earthing the handles. By this means workers are discharged before they enter a building. In order to make doubly sure, an electroscope is provided inside all buildings and workers, before they handle any powder, must prove themselves to be discharged.

S. G. Hill, African Explosives and Industries, Ltd., before the Institution of Certificated Engineers, South Africa, and abstracted in *Canadian Chemistry and Process Industries*, January 1942.

PETROLEUM AND THE WAR

A TOTAL OF some 12,190,000 passenger cars, trucks, and buses were registered in the East Coast area in 1941, but scrappings during the year reduced the number operating on January 1, 1942, to 11,279,000, of which some 9,783,000 were passenger cars. Gasoline consumption normally accounts for 40 percent of the total demand for petroleum products on the East Coast, but gasoline for passenger cars will have to be curtailed far more than its proportionate share of the total since vital defense industries, oil-burning merchant vessels, army and navy needs, trucks, farm vehicles and other essential consumers must continue to receive 100 percent of their needs.

Total essential demands for petroleum products on the East Coast for the last nine months of 1942 have been estimated by the Petroleum Industry War Council at an average of 1,300,000 bbl. per day, or more than 200,000 bbl. per day less than it would have been without the transportation shortage. This estimate already includes a cut



Conveying ... anywhere a pipe line can be run

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The Fuller-Kinyon System, for conveying dry pulverized materials, is unique in many respects. One of the important features is that it cuts corners to shorten conveying distances . . . pipe lines can be run anywhere . . . overhead or underground . . . horizontally, vertically, up or down hill. Installations can be made where conditions would make any other system an impossibility. Distribution can be made to any number of delivery points.

Installation cost for the average system is low and maintenance costs are negligible . . . the system will soon pay for itself. There is no dust nuisance or dust hazard.

Photographs on left show a Fuller-Kinyon System installed on the Pacific Coast. Top Photo—pipe lines for conveying cement from silos to a bulk-cement carrying, ocean-going vessel. Conveying distance approximately 3600 feet. Bottom photo—Fuller-Kinyon Portable Pump withdrawing cement from silos.

•

Some materials conveyed by FULLER-KINYON SYSTEMS

Bauxite	Gypsum
Cement	Kaolin
Cement raw materials	Lime
Chalk	Limestone
Clays (dried)	Manganese dioxide
Coke dust	Phosphate rock
Feldspar	Soda ash
Flue dust	Sodium bicarbonate
Fullers earth	Starch
Gluten feed	

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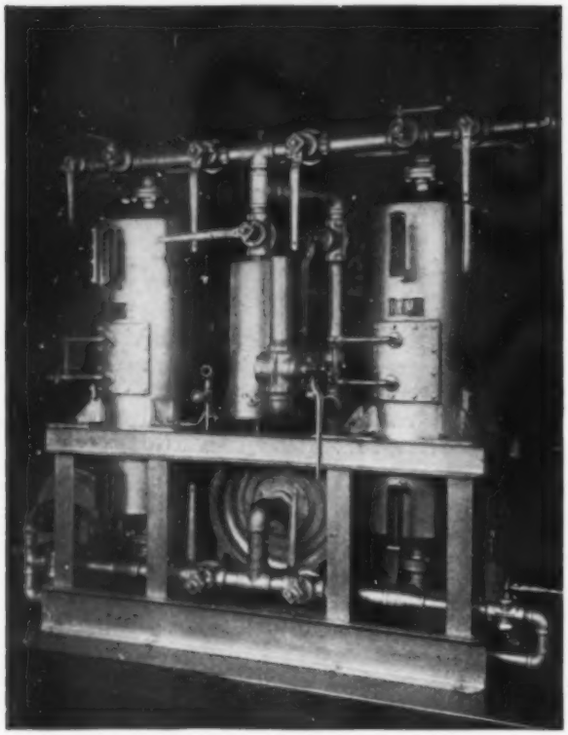

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of 25 percent in the consumption of gasoline and 10 percent for all light heating oils and assumes the conversion of many heavy fuel oil installations to coal. Hence this 25 percent curtailment for gasoline is actually equivalent to more than 50 percent for many passenger cars, because essential vehicles can not be rationed. And still this minimum demand will be difficult to meet in spite of curtailment and greatly increased overland transportation by tank car and pipeline. The present scheduled effective carrying capacity of the ships in East Coast service probably does not average more than 30 percent of normal tanker deliveries.

One petroleum product of which Germany's shortage appears to be the most serious is that of heavy lubricating oils. Almost all elevators have been shut down due to this lack. Extraction plants have been installed in many industrial plants to recover oil from rags and waste used around machinery and vegetable oils have been pressed into service with unsatisfactory results. It has been reported that some of the oil from downed planes shows evidence of having been used well beyond what this country considers safe practice.

Difficulties of a German air blitz over England are obvious. Suppose Germany should decide to make an attack which would utilize 8,000 bombers and 4,000 pursuit planes. This would require some 200 suitable airports available along the invasion coast of Western France around to Norway. Preparing for such an attack would mean that provisions would have to be made for storing, maintaining, fueling, and taking on and off an average of 60 planes at each airport in spite of probable attack. To put such a fleet of 12,000 planes into the air for only 5 hours per day would require about 7,000,000 gal. of gasoline and probably an excess of 18,000 tons of bombs per day. With the limited overland transportation facilities available, such an attack for a week would require several weeks of preparation and once the material was brought in, it would then be subject to loss by bombing.

Robert E. Wilson, president, Pan American Petroleum & Transport Co., before the Junior Chemical Engineers of New York, New York, April 17, 1942.

MENTHOL FROM THYMOL BY A NEW PROCESS

SYNTHETIC RACEMIC menthol, m.p. 35-36.5 deg. C., with properties sufficiently similar to those of the naturally occurring *levo*-menthol to permit substitution for the latter in many of its uses can be prepared from thymol in good yields by industrially feasible reactions. Normal menthol imports formerly amounted to about 400,000 lb. annually from Japan. Since the bombing of Pearl Harbor, the price of menthol has jumped to $14 per lb. although it is normally around $3-4.

Hydrogenation of an excess of thymol in alkaline, aqueous solution with Raney nickel catalyst gives a 70 per-

cent conversion to an alkali-insoluble product, up to 80 percent of which is ketonic in nature. Vacuum rectification of this hydrogenation product in a 60-plate Lecky-Ewell column permits the isolation of pure *dl*-menthone, m.p.—18 to —17 deg. C., as 50 percent of the distillate. The remainder of the distillate is contaminated with *dl*-isomenthone and the isomeric alcohols related to the two ketones.

Reduction of the *dl*-menthone with sodium in moist ether gives a quantitative yield of alcoholic products. Sixty percent of the distillate obtained by vacuum rectification in the 60-plate column consists of pure *dl*-menthol, m.p. 35-36.5 deg. C., after slow crystallization at room temperature, the remainder being contaminated with isomers of menthol.

Since the byproducts of this synthesis can be reconverted to starting material, the process is potentially able to fill the need for a domestic source of menthol. The process is being developed to commercial-scale operations at Delawanna, N. J. by the chemists of Givaudan-Delawanna, Inc. and of the Purdue Research Foundation.

A. L. Barney and H. B. Hass, Purdue Research Foundation and the Department of Chemistry, West Lafayette, Ind., before the American Chemical Society, Memphis, Tenn., April 20-24, 1942.

CONDENSER-SUBCOOLER PERFORMANCE AND DESIGN

THIS PAPER presents an experimental study of and the resulting suggested design outline for the type of vertical condenser of organic vapors in which the vapors pass downward inside tubes and the tubes are of sufficient length so that the condensate is subcooled to a temperature approaching that of the inlet cooling water.

The test condenser used was a single ¾-inch I.D. copper tube, about 3 feet long, cooled by water flowing upward in a narrow annular space in spiral motion. Temperatures of the water were measured at 3-inch intervals, and a traveling thermo-couple along the axis of the tube permitted temperature observations at any elevation inside the tube. The outlet condensate temperature was also measured. Runs were made on acetone, isobutanol, and trichlorethylene, as typical organic vapors. Rates of vapor flow to the condenser were varied from a value great enough so that some uncondensed vapor passed out the vent at the bottom of the tube and no subcooling occurred, to lower values with various degrees of subcooling.

Condensing film coefficients of heat transfer were in satisfactory agreement with the Nusselt equation. However, the customary log mean temperature difference was found to be somewhat in error, though on the conservative side. The average condensate temperature, t_a, at the end of the condensing section agreed satisfactorily with theory, i.e., $t_a = t_v - \frac{3}{8} \triangle t_c$, where t_v is vapor temperature and $\triangle t_c$ is temperature drop across the condensate

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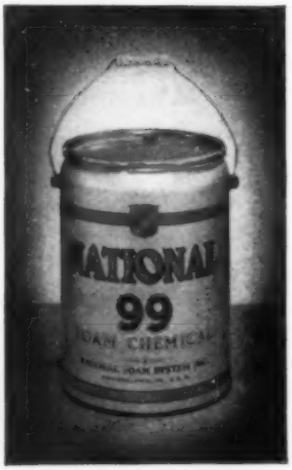


layer. A simpler, though empirical, relation for this temperature which is more convenient for design was found to be $t_a' = t_v - 0.3\ (t_v - t_i)$, where t_i is inlet cooling water temperature. The subcooling film coefficients were in satisfactory agreement with the equation for heat transfer to vertical liquid layers in laminar flow developed by Drew, Bays, and McAdams.

The design procedure recommended includes: estimation of the average condensate temperature at the end of the condensing section to permit a break-down of the total heat load into that in the condensing section and that in the subcooling; prediction of the separate film coefficients in each section by methods mentioned above; selection of proper mean temperature differences in each section; and finally, calculation of the tube length for each duty, the sum of which gives the total length of condenser tube required for any given number in parallel.

A. P. Colburn, L. L. Millar and J. W. Westwater, University of Delaware, Newark, Del., before the American Institute of Chemical Engineers, Boston, Mass., May 11–13, 1942.

INDUSTRIAL UTILIZATION OF TOBACCO

SINCE TOBACCO in recent years has become a surplus commodity, the Eastern Regional Research Laboratory of the U. S. Department of Agriculture has undertaken a program of research to find more extended industrial uses for it. Nicotine is being given first consideration.

For insecticide purposes, a new series of double salts of nicotine have been prepared. These are characterized by very low solubility, extreme fineness of division, and the presence of a heavy metal, such as copper. Nicotine-dye combinations have been used to impregnate fibers. Dusts of rubber and of synthetic plastics containing up to 10 percent nicotine have also been prepared.

Improved methods of oxidizing nicotine to nicotinic acid for use as a food accessory are being sought, preferably methods that involve atmospheric oxygen with a catalyst. Some success has been attained with vanadium oxide catalyst. Attempts are also being made to simplify and cheapen the recovery of nicotine from tobacco.

Recent events have brought about a threat of shortage in nicotine supplies. Curtailment of pyrethrum and derris from the Orient will have to be met in part by increased use of nicotine. Increased food production will create a greater demand for nicotine for use in insecticides. A large amount of nicotine will be required for the manufacture of nicotinic acid, unless other possible raw materials become available.

M. J. Copley, R. K. Eskew, and J. J. Willaman, Eastern Regional Research Laboratory, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Philadelphia, Pa., before the American Chemical Society, Memphis, Tenn., April 20-24, 1942.

INDUSTRIAL RESEARCH INSTITUTE MEETS IN CLEVELAND

The 2300 industrial research laboratories in this country provide an invaluable reservoir of ideas, organized scientific knowledge, and special facilities for the solution of the many new technical problems growing out of the war effort. This fact was given particular emphasis at the recent Fourth Annual Meeting of the Industrial Research Institute in Cleveland, on May 22 and 23, with headquarters at the Hotel Statler. Over fifty industrial executives and research directors participated in roundtable discussions which dealt chiefly with the adjustment of research programs and personnel to meet war conditions.

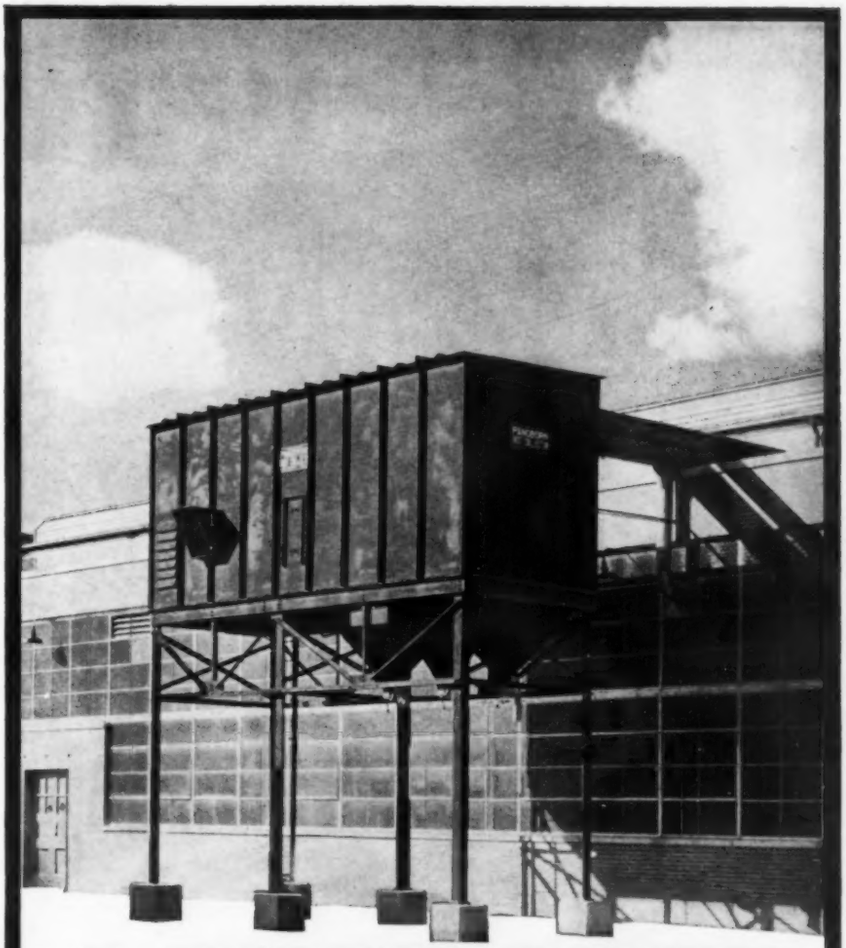
H. S. Benson, administrative engineer, Research Division, United Shoe Machinery Corp., Beverly, Mass., was elected chairman, and Wm. H. Hainsworth, vice-president, Servel, Inc., New York, vice-chairman, of the Institute's executive committee for the ensuing year. Two new members of the committee were also elected for three-year terms, Philip W. Pillsbury, president, Pillsbury Flour Mills Co., Minneapolis, and Harold K. Work, manager of research and development, Jones & Laughlin Steel Corp., Pittsburgh.

The Industrial Research Institute, an affiliate of the National Research Council, undertakes to promote improvement of methods and more economical and effective management in industrial research through the cooperative efforts of its members. The membership is composed of forty-five industrial concerns maintaining research laboratories. Other members of the executive committee are F. W. Blair, chemical director, The Procter & Gamble Co., Ivorydale, Ohio; Caryl P. Haskins, president, Haskins Laboratories, New York; Maurice Holland, division of engineering and industrial research, National Research Council, New York, and R. C. Newton, vice-president, Swift & Co., Chicago.

MORE INDUSTRIAL EXPLOSIVES USED LAST YEAR

A large increase was recorded in the quantity of explosives used for mining, quarrying, road-construction and other industrial purposes in 1941. Reports to the Bureau of Mines from manufacturing companies showed an increase of nearly 14 percent over 1940 in the total quantity of explosives used, which reached 482 million pounds in 1941. This figure relates to non-military explosives only and it also does not include imports or exports of industrial explosives nor does it cover ammunition or fireworks.

Of the total quantity of explosives used, 59 million pounds were black blasting powder, 71 million pounds were permissible explosives, and 352 million pounds were high explosives other than permissibles. Virtually all of the permissible explosives, which form a class designed especially for use in coal mines with a view to promoting safety, were used in coal-mining operations.



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Republic ENDURO Stainless Steel is the nearest approach to the perfect metal for equipment of many kinds in many industries. It withstands corrosive attack and wear far better than most other metals. However, proper care requires only a little time. Give your stainless steel equipment regular, systematic care and you will be repaid in maximum service life.

Follow These Suggestions for Longer Service Life...

1 Cleanliness is of utmost importance. This cannot be stressed too strongly. See section on "How to Clean ENDURO" below.

2 Remove materials and deposits that tend to adhere to the surface of the stainless steel, especially in crevices and corners. It may be impossible to do this while the equipment is in operation. In that case it should be done as soon as the equipment is idle. If at all possible, sweeten or neutralize any sour or acid solutions.

3 Use same types of metals together where possible. Work for uniformity in regard to solutions, temperatures, agitation, concentrations and surface conditions. This will help avoid galvanic cell corrosion possibilities. Such uniformity frequently is impossible to attain and a certain amount of corrosion must then be expected. This corrosion, however, may be greatly retarded by careful cleansing and by periodic restoration of surface passivity of the metal by simply exposing parts to clean air.

4 Avoid prolonged standing of chlorides, bromides, thiocyanates and iodides in stainless steel equipment, especially if acid conditions exist. The pitting action of these compounds may be retarded or avoided by making solutions alkaline. If this is not possible, avoid long contact of compounds with the metal and clean frequently.

5 Be sure the chemicals you employ are recommended for use with stainless steel. Republic Steel Corporation has published a list of foods, chemicals and acids, showing their effect upon stainless steel. If you do not have a copy, write for one.

6 Avoid corrosion fatigue. This is usually the result of a combination of cyclic stresses and mild corrodents. The remedy is to make the equipment sufficiently strong to withstand any stresses which may be encountered. If this is not possible, the equipment or unit should be so constructed as to permit freedom of movement of the entire unit.

Individual cards are available for the following types of equipment:

PROCESS AND CHEMICAL
PULP AND PAPER
FOOD AND BEVERAGE PROCESSING
FOOD HANDLING AND SERVING
TEXTILE
DAIRY

N ENDURO STAINLESS STEEL EQUIPMENT ★

...s and Their Reactions to Stainless Steel

TRADE NAME	HOW APPLIED	EFFECT ON FINISH
5% Oxalic Acid (use warm) or 5-15% Nitric Acid. Always follow with a 5% Sodium Carbonate or neutralizer rinse.	Swab or immerse.	Good discoloration remover.
4. *The following detergents and solvents are excellent removers of grease, oil, fatty acids, milk-stone, etc., where scrubbing or rubbing is not practical:* 5-15% Caustic Soda (hot or cold) .1 to .5% solutions of Sodium Metasilicate, Trisodium Phosphate, Sodium Metaphosphate, Sodium Pyrophosphate	Will remove grease, milk-stone, etc.	All excellent removers of grease, oil, and milk-stone.
5. *The following organic solvents may be used for removing oils and grease deposits:* Carbon tetrachloride, trichlorethylene, acetone, kerosene, gasoline, naphtha, benzene, ether, alcohol. These solvents should not be used for cleaning food containers or other equipment where possible contamination is a factor.		
6. *Ordinary steel wool or steel brushes should never be used on stainless steel surfaces.* Particles of steel may become imbedded in the stainless steel surface and rusting of these particles will eventually appear as stains. However, steel wool or sponge on stainless steel equipment. Heat tint removers will usually scratch. Oakite, a fibrous material in removing scratch pads for applying		

REPUBLIC *Enduro*

Other Republic products include Steel and rust-resisting Toncan* Iron Pipe, Sheets and Roofing—Upson Bolts,

Get Longer Life

FROM YOUR

Stainless Steel Equipment

Your stainless steel equipment is worth more today than money in the bank. Nickel and chromium—vital alloying elements in stainless steel—are needed for *Wartime Production*—for airplanes, guns, tanks, ships and other armament.

Hence, stainless steel is scarce. You may not be able to replace your present equipment—one of your greatest production assets—*and you should take every precaution to prolong its useful service life.*

Resistance to corrosion and oxidation—to wear—to rough use—are inherent qualities of Republic ENDURO* Stainless Steel. In most classes of service it lasts longer than other types of materials. *BUT*—by exercising care in cleaning and taking a few simple precautions, this ordinarily long service life can be materially extended.

From the time when stainless steel was first introduced, Republic metallurgists have spent long hours in all kinds of plants studying the performance of ENDURO in every type of service. This *unequalled* experience has qualified them to make specific recommendations on the care of ENDURO and the dangers to be avoided in various industries.

To help you conserve your stainless steel equipment, we have printed these suggestions on easy-to-read wall cards, which may be posted in a convenient place in your plant. Separate wall cards are available for the following specific types of equipment—(1) Textile, (2) Pulp and Paper, (3) Process and Chemical Equipment in general, (4) Food and Beverage Processing—meat packing, canning, etc., (5) Food Handling and Serving—restaurant, hotel, hospital and institutional kitchen and service equipment, and (6) Dairy.

We're supplying these cards to fabricators of ENDURO equipment for distribution to their customers. Ask your fabricator for one—or for several, if your plant is large. *If he does not have them,* WRITE US DIRECT. *Be sure to state the nature of your operations and how many cards you need.*

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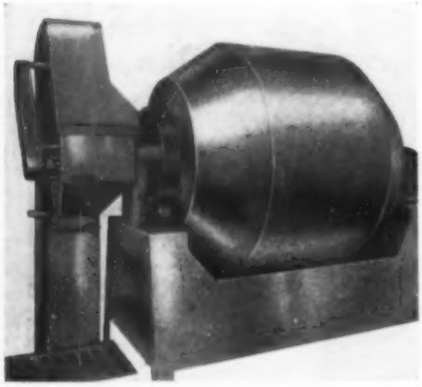
Skilled men are growing scarce—mechanized war demands specialists in every line in the field and in direct armament production.

You need modern equipment that will perform unfailingly—take up the slack and increase production, even with a less skilled working force.



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of the process industries, you will find a surprising number of Prater Installations. They are there because they were sold on a guaranteed basis of capacity per horsepower and control of quality. May we do the same for you.

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Please send me complete information on Prater Processing Equipment.

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PRATER
PROCESSING EQUIPMENT

SELECTIONS FROM FOREIGN LITERATURE

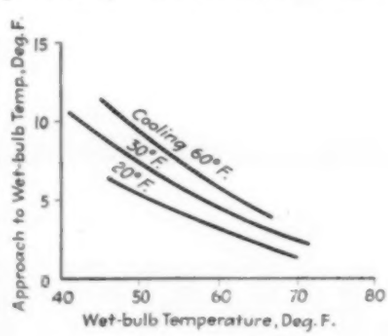
AMMONIUM SULPHATE FROM COKE

CONTAMINATION of ammonium sulphate with oil or tar vapors from the ammonia causes browning; iron and arsenic from commercial sulphuric acid give gray or yellow tints respectively. Black stains arise from formation of neutral zones in the saturator. Saturators are made in a variety of designs. Outstanding examples are the Colson, Wilton, Collin, Hinselmann, Flasche, Koppers, Bamag, Coppee, Zimmermann-Jansen, Otto and Hengen saturators. Modern types are generally steel-jacketed. The cover, formerly lead-lined, is now generally lined with acidproof stone because of longer life. Tiles used for this purpose are baked so hard that they are completely impermeable to liquids and highly resistant to sulphuric acid. Lining of saturators with acidproof stone is extremely important and seams must be absolutely liquid-tight. Recently it has been found that a double lining of acidproof stone protects the saturator wall as effectively as the former lining of acidproof stone on 3 mm. of sheet lead. Shaped stones are made to fit corners, bends and the like. A special acidproof waterglass cement is used for joining tiles in the lining. For special metal parts which must resist sulphuric acid, phosphor bronze and Corrix metal (an alloy of iron, copper and aluminum) give good service.

Digest from "Ammonium Sulphate Production in Coke Works. II. Saturator Designs," by A. Thau, *Oel and Kohle* **37**, 302-15, 1941. (Published in Germany.)

COOLING TOWERS

IN CHIMNEY draft and forced draft, coolers have different performance coefficients since draft in the former depends only on the chimney effect, which is itself dependent on temperature relations in the tower. When this limitation is duly considered the results of tests in forced draft towers can be used to calculate the size of tower needed for a specified job or performance at different temperatures. Test results have been successfully used to design a tower for cooling water at the rate of 17,500 gal. per hr. from 81 to 58 deg. F. at a wet bulb temperature of 51 deg. F., with provision for an overload capacity of 35,000 gal. per hr. This called for an air flow of 100,000 cu. ft. per min., provided by a fan 114 inches in diameter at the base of the tower. It appears that a film action rather than a spray action is desirable in cooling towers. The effect of varying wet bulb temperature under different heat loads in the experimental forced draft tower is illustrated by the drawing.



Digest from "Design and Performance of Cooling Towers," by W. K. Hutchison and E. Spivey, *Industrial Chemist* **18**, 83-7, 1942 (discussion 87-8). (Published in England.)

DEHYDRATING ALCOHOL

METHYLENE DICHLORIDE has been chosen from a large number of candidate solvents to serve as the entrainer in azeotropic distillation of water from alcohol. It is one of the few available organic liquids which forms an azeotrope with water but not with ethanol. The azeotrope contains 1.8 percent water and boils at 38.1 deg. C. Pure methylene dichloride boils at 40.7 deg. C. Its solubility in water is 2 percent at 20 deg. C. but water is only 0.2 percent soluble in methylene dichloride. The steam consumption for dehydrating alcohol with methylene dichloride is 166 kg. per hl. as against 220 kg. per hl. with benzene as entrainer.

Digest from "New Method for Dehydration of Alcohol," by S. B., *Chemistry and Industry* **61**, 120–1, 1942. (Published in England.)

DRY COLORS

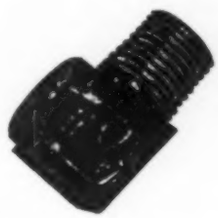
RECENT advances in dry color manufacture have chiefly improved tint, tinting strength, light fastness, grinding speed or hiding power. In reds the dark paras, long known as hard grinding pigments, are now much easier to grind and have greater hiding power than before. This was achieved with a slight sacrifice in tinting strength, which is generally less important than hiding power in the dark para reds. Indanthrene maroon is now in domestic production and a new light toluidine maroon has been developed; both grind more easily than maroons of a few years ago.

In yellows the lead chromate pigments have been improved as to light fastness, grinding ease and tinting strength. Their growing use in synthetic vehicles makes ease of grinding increasingly important, although chrome yellows were not difficult to grind in the older vehicles having more affinity for pigments. Domestic Hansa yellows now give cleaner and stronger tints than the imported products. Acetoacetarylides for making Hansa yellows are now commercially available in wider variety than formerly, thus increasing the color range.

In greens the light-fastness and grinding behavior of chrome greens are now greatly improved. One of the most brilliant light-fast greens is now made from Hansa yellow and a phthalocyanin blue. The phthalocyanin greens and blues have been so far developed

MONARCH CHEMICAL SPRAY NOZZLES

of



BRASS:

The Fig. 629 nozzle illustrated is of the "non-clog" type; i.e. it contains no internal vanes, slots, or deflectors which might facilitate clogging.

Available $\frac{1}{4}$" or $\frac{3}{8}$" male pipe connection and $\frac{1}{4}$" to 1" female pipe. (Fig. 631). Small sizes produce a very fine, soft, wide angle spray at low pressures. Capacities 4.7 G.P.H. up.

STONEWARE:

Monarch Fig. 6020 and Fig. 6040 stoneware sprays have replaced most other types of nozzles used in acid chamber plants throughout the world. Last almost indefinitely in sulfur gases and will not break or crack from temperature changes.

STAINLESS:

Available in capacities from .57 g.p.h. Fig. F-80 style) to 104 G.P.M. (Fig. B-8-A style). "Hollow" cone, "Solid" cone, and "Flat" sprays furnished in pipe sizes and capacities and materials to suit practically any problem where corrosive liquids are sprayed.

Write for Catalogs 6A and 6C

Note: Priorities are required on all equipment.

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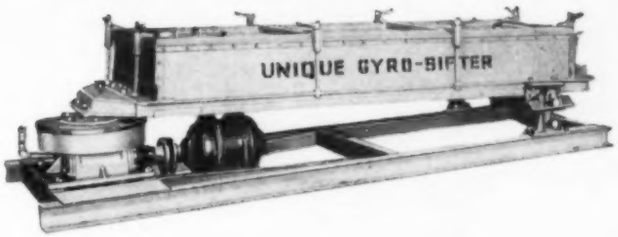
2730 E. WESTMORELAND ST.
PHILADELPHIA, PA.



SOLVE SIFTING PROBLEMS WITH A UNIQUE GYRO-SIFTER

The UNIQUE Gyro-Sifter is built in many sizes, one to four sieves deep, and clothed as may be specified. They have found wide favor in the Chemical Industry because of their efficient operation, ease and simplicity of maintenance. The material enters the head of the machine and is evenly distributed over the entire width of the sieve. As the product passes down the sieve length, the gyratory action is gradually reduced as the tailing end is reached. Rubber ball cloth cleaners beneath the clothing are in constant agitation through the combined action of the sieve box and baffle rods, striking the clothing with sharp blows, freeing the openings and maintaining maximum production.

Write for Bulletin 41-E.

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Stop DUST with DRACCO DUST CONTROL

Dust ALWAYS causes serious losses—that's why DRACCO Dust Control ALWAYS proves a good investment. It will (1) protect health of workers; (2) reduce repair bills and prolong life of equipment; (3) increase the efficiency of entire plant; (4) protect you against expensive and annoying law suits. Why not consult DRACCO Engineers? They have over 25 years experience correcting dust conditions of every description.

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that they now represent the greatest advance in pigment technology in a century. For deep tints the iron blues, which have also been improved, still hold their own against phthalocyanin blues for cost reasons.

Digest from "Dry Colour Manufacture," by Clayton W. Reynolds, *Canadian Chemistry and Process Industries* 26, 133–7, 1942. (Published in Canada.)

CALCIUM ALUMINATES

DISINTEGRATION of concrete in sulphate waters is due to the low resistance of tricalcium aluminate. Sulphate resistance of precast concrete is greatly increased by steam curing. The effect of steam was first thought to be conversion of tricalcium aluminate to the cubic hexahydrate since this form is much less soluble than the hexagonal hydrates in sulphate waters. Exposure tests showed, however, that concrete containing the cubic hexahydrate deteriorates in a matter of weeks whereas steam-cured concrete resisted sulphate water for years. Closer study of steam curing and its effects revealed that if the operation is conducted under conditions favorable to hydrolysis, a crystalline form of calcium aluminate is produced which has very high resistance to attack by sulphate waters. Work on the identification of this crystal form is in progress.

Digest from "Aluminates of Calcium," by Thorbergur Thorvaldson, *Canadian Chemistry and Process Industries* 26, 172-4, 1942. (Published in Canada.)

NATURE OF ELASTICITY

THE GREATEST contrast between rubber-like and crystalline polymers is found in their behavior when a stretched test piece is released. High polymers of ethylene resemble gutta percha in retaining their crystal structure and about 90 percent of their stretch while rubber undergoes instant and almost complete recovery, losing its crystalline orientation in the process. Near the melting point in crystalline polymers shearing becomes easier, thermal motion disintegrates the crystals and spontaneous contraction occurs. Small initial contraction slightly relaxes lateral compression, thus giving more room for molecular motion, permitting further contraction. Since molecules in the amorphous substance can slip past each other almost as easily as in a liquid, recovery is so rapid as to produce the familiar snap of a stretched rubber band.

Digest from "Molecular Structure and Rubber-Like Elasticity. III. Molecular Movements in Rubber-Like Polymers," by C. W. Bunn, *Proceedings of the Royal Society* **180A**, 82-99, 1942. (Published in England.)

ELECTRIC COKING

SINCE external heating of coke ovens necessitates destructive wall temperatures for attainment of effective internal temperatures, a method of electric heating from within has been developed. The heat effect is obtained by making coal itself the resistance element. Above about 400 deg. C coking coals conduct electricity, and the

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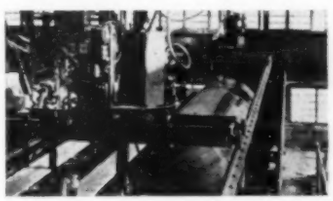

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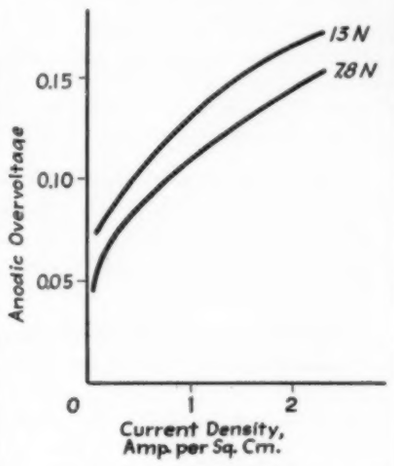
higher the temperature the greater the conductivity. The coal is thus in direct contact with the generated heat. The method has even been adapted to continuous coking in vertical ovens. One design has a preheating zone at the top, a middle (coking) zone and a cooling zone at the bottom. For batch coking the charge is fed to the oven in metal containers which are connected to the source of current. A major advantage of electric coking is that oven walls last much longer because they are not subjected to such severe temperature stresses as externally fired ovens. There are also other economies in production.

Digest from "Electric Coking of Coal," by Heribert Kirchrath, *Chemiker-Zeitung* 65, 149–41, 1941. (Published in Germany.)

PASSIVATING LEAD

IN PASSIVATING lead by the sulphation method, a shift in potential corresponding to the transition to a passive state occurs when the current density in the pores of the metal reaches a certain level which does not depend on the polarizing current. In the passive state of the electrode its ohm resistance increases as the polarizing current decreases. Curves for Pb overvoltage show that the shift in potential in a constant voltage passivating current (at least in the initial stages of passivation) is the increase in Pb overvoltage as current density increases in the pores. The curves represent anodic overvoltage on Pb in 7.8 and 13 N H_2SO_4 when the Pb surface is 30 percent covered with $PbSO_4$, current density in amp. per sq. cm., recalculated for a smooth electrode. It was also found by experiment that the thickness of the salt film on passivated Pb follows Peukert's empirical equation, $Q = I^n$ where Q is salt film thickness and I is current density. The exponent n is approximately 1.2 in 8 N H_2SO_4 and 1.5 in 13 N H_2SO_4.



Digest from "Influence of Overvoltage and Ohm Resistance in Passivating Lead" and "Crystallization of Lead Sulphate and the Thickness of the Passivating Film on Lead," by B. N. Kabanov, *Comptes rendus (Doklady) de l'academie des sciences de l'USSR* 31, 339-43, 581-4, 1941. (Published in Russia.)

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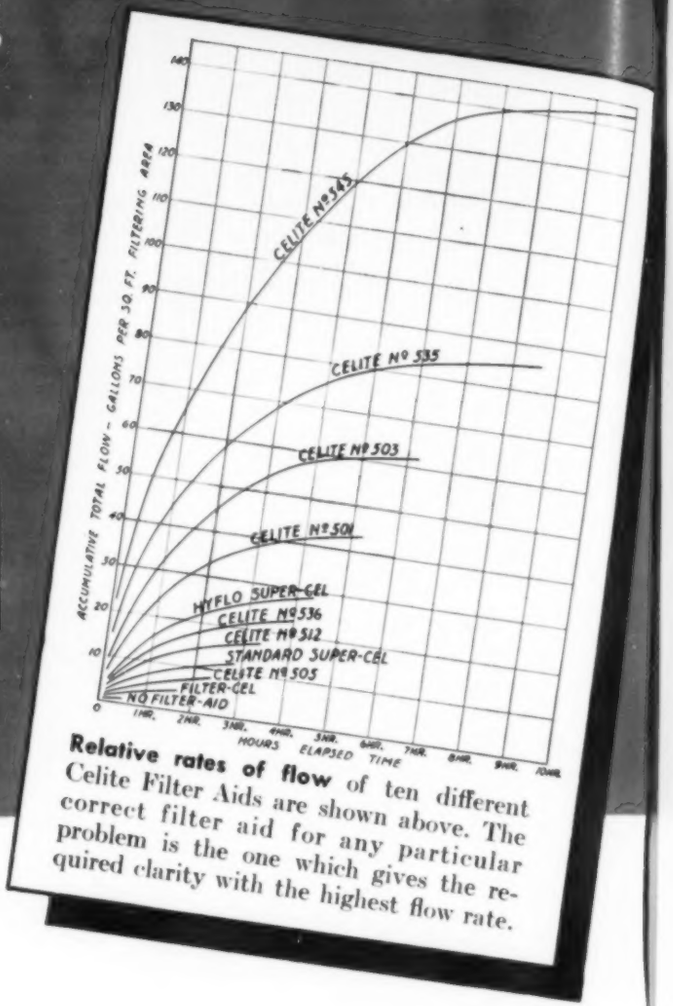

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SURVEY OF SCIENCE

THE MEN WHO MAKE THE FUTURE. By *Bruce Bliven*. Published by Duell, Sloan & Pearce, New York, N. Y. 325 pages. Price $3.

Reviewed by *M. H. Hamilton*

AT NO time in history have the six words comprising the title of this book held more significance. With chaos and destruction rampant throughout the world and the fate of mankind hanging perilously in the balance, the infinite potentialities of the future assume gigantic proportions. Already people with vision all over the world are considering the problem of the reconstruction that must come when the war is over. Civilization obviously must be rescued from the morass into which it has fallen—but to whom can the job be entrusted?

Bruce Bliven, editor and president of *The New Republic*, answers this question in a book that is as entertaining as a modern novel and as provocative as a political platform. Unequivocally he asserts that men of science are the salvation of the world as we know it by virtue of two facts. First, the trained scientific mind has a greater capacity to deal with problems impersonally and without prejudice than the laymen; and secondly, because modern science as it has developed in the last few generations offers wider horizons of living than have ever before been conceived. It is not within the province of this review either to justify or refute the author's claims. It is possible, however, to point out the limitations of Mr. Bliven's thesis and remember that Plato's dreams of "philosopher-kings" were not without substance.

On the whole, however, the book is an amazing survey of the unquestionable wonders of American science. A product of much research and countless interviews with eminent scientists throughout the country, it provides a stirring record of scientific achievement that passes beyond the comprehension of the average man.

Written by a layman who professes a vast ignorance of science, it is designed to be read by laymen. There is no attempt at pedantry, no suspicion of the ponderous. The most weighty matters are described in concise, everyday words, and illustrated by figures that achieve clarity by virtue of their simplicity. Take, for example, the chapter entitled "The Scientists Look At Our World." In this the author lists what are believed to be the five most exciting prospects on the horizon of science. These five are: the electron microscope which will magnify 10,000 to 30,000 times instead of the 2,500 times now possible; the cyclotron, the machine for smashing atoms; the study of atomic energy, which may transform the world; the discovery of the sulfa drugs which have already revolutionized medical science; and the use of colchicine, the poisonous drug that is now being used to create new varieties of plants artificially. Throughout the entire chapter, despite the vastness of the material with which he was dealing, the author maintained his balance and never lost his footing.

The scope of the book is tremendous. Beginning with the question of genes and heredity, it progresses through the latest developments in physics, chemistry, botany, and astronomy, until it reaches science and civilization and the prescription that science offers to civilization. It is a book that should be read widely by people of all ages. Like the vitamins it extols, "The Men Who Make the Future" offers an amazing reward for very little effort.

STANDARD PETROLEUM REFERENCE

PETROLEUM REFINERY ENGINEERING. Second edition. By *W. L. Nelson*. Published by McGraw-Hill Book Co., New York, N. Y. 715 pages. Price $6.

Reviewed by *H. W. Sheldon*

PROFESSOR NELSON'S second edition of "Petroleum Refinery Engineering" is an excellent compendium of the many valuable relationships derived during the "Modern" period of the petroleum industry presented as an integrated and useable tool for both the technologist and the student. This volume has a high value in the refinery engineer's library as a standard reference book useful in the application of the many specialized principles involved in a complex field of endeavor. A comprehensive outline of the modern processing technique rounds out a most useable and valuable book. This new edition has added several new chapters and has attempted to bring the volume up to date on the new developments. Its chapter on Rebuilding Hydrocarbons is well worth mentioning.

SODIUM CARBONATE

MANUFACTURE OF SODA. Second edition. By *Te-Pang Hou*. Published by Reinhold Publishing Corp., New York, N. Y. 590 pages. Price $9.50.

THOROUGHLY revised and enlarged, the second edition of this excellent monograph retains all the good features of the earlier one which appeared in 1933. Almost every chapter throughout the book has been rewritten, re-organized and brought up to date. The resulting enlargement is amply shown by the fact that the present book contains 225 or 62 percent more pages than the first.

Nor is this all. Many more tables of data have been included and the number of illustrations and engineering drawings has been doubled. In addition, the second edition contains five entirely new chapters dealing with the purification of brine, wet calcination of sodium bicarbonate, boiler operation and conditioning of boiler feed and cooling water, modifications and new developments of ammonia soda process, and centrifugal pumps as applied to the ammonia soda industry.

Most of the new material represents additional data made available by progress in the ammonia soda industry within the past ten years. The author not only deals with developments in this country, but also with those in Russia, Japan, China and others. As in the first edition, special attention has been devoted to the ammonia soda process.

Dr. Hou's efforts have succeeded in making this book just about everything that could be desired from an industrial and technological monograph on the subject. Needless to say, this "practical treatise" should be placed at once on the "easily available" section of the bookshelf of every chemical engineer, industrial chemist, scientific library, chemical instructor, statistician, government expert, and manufacturer or consumer of soda ash.

PRODUCTION AND USE OF PLASTICS

PLASTICS IN ENGINEERING. Second edition. By *J. Delmonte*. Published by Penton Publishing Co., Cleveland, Ohio. 601 pages. Price $7.50.

ALTHOUGH the first edition of this work was published in 1940, circumstances and developments have influenced markedly the trends in the plastics industry. New materials, equipment, methods and applications bespeak continued growth and expansion. In addition, new situations have developed which expedite the adoption of plastics by various manufacturers. They are being substituted wherever possible for the strategic metals such as brass, copper, tin, aluminum, and stainless steel.

This book has been prepared primarily for the benefit of the man who works with plastics—designer, molder and fabricator. Many of the chapters deal with such subjects as: factors affecting hot or cold molding; extrusion of plastics; construction and design of molds; design and specification of plastics; and styling the machine for plastics.

The chemical engineer will be more interested in the chapters covering preparation of organic plastics, organic plastics in surface coatings, and synthetic rubbers and rubber-like materials. These sections contribute little information on the chemical engineering involved in their production. They

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deal mainly with the industrial chemistry. However, in the chapter on rubbers, the author does discuss their resistance to alkalis, acid, oils, temperature and exposure to weather. He also mentions their use for such applications as gaskets, packings, diaphragms, electrical insulation and vibration absorption.

THE CONDENSED CHEMICAL DICTIONARY. Third edition. Edited by *Thomas C. Gregory*. Published by Reinhold Publishing Corp., New York, N. Y. 756 pages. Price $12.

OF ALL the many chemical dictionaries available, the "Condensed Chemical Dictionary" is probably the best known and most frequently consulted. In the new revised edition its usefulness is increased by the addition of several thousand new entries. Most of the newcomers are trade or brand names and their inclusion is commendable.

The style of presentation remains the same and for each item the data given usually consist of formula (but not molecular weight), color and properties, constants, solubilities, derivation, method of purification, grades, containers, uses, and railroad shipping regulations. Occasional enthusiastic claims listed for some products lead one to believe that the data given were taken from manufacturer's literature.

HANDBOOK OF CIVILIAN PROTECTION. Prepared by the Civilian Defense Council of the College of the City of New York, edited by *Louis L. Snyder*. Published by Whittlesey House, New York, N. Y. 184 pages. Price $1.25.

Reviewed by *J. R. Callaham*

IT WAS NOT for the engineer or the technical man that this handbook was written, but for the man in the street, the American of average education. And for its purpose, the book is admirable; the style is simple and concise, the subject matter fundamental, logically presented and well outlined. Among the praiseworthy features of the book are the "Ten Commandments" displayed at the end of each chapter.

"The only thing to be counted upon is the unexpected; the only thing that is sure to happen is the impossible!" Thus the first chapter, dealing with total war and the civilian is introduced. The temper of the book is healthy and aggressive, and one soon becomes aware that complacency is the one unpardonable sin: "The point has been dangerously overstressed that, although our Atlantic and Pacific Coasts and even the industrial Middlewest are theoretically subject to hit-and-run raids, these would be of a 'token' character, principally for their effect on civilian morale. *This complacent view of our ocean defense, if widely held, would tend to undermine the vigilant civilian as well as military preparedness needed to repel an alert and desperate enemy.* Such complacency explains Pearl Harbor." Thus it is stressed that the war we are fighting is a "total" war. Every American should remember, as does

every Hollander, that in one hour some 30,000 *civilians* of defenseless Rotterdam were killed in a "demonstration" blitz by the Nazi air force.

In the chapter on incendiary bombs, the authors point out that one enemy bomber can start at least 100 fires on an area the size of New York City. The 1,000 simultaneous fires that only ten bombers could start in New York or San Francisco could certainly give us something very serious to think about. Such Jap "face-saving" raids on the West Coast and German "morale-breakers" for the East are neither impossible nor improbable.

Individual chapters in the book deal with such subjects as the meaning of total war to the civilian, air raid conduct and services, fire-fighting, incendiary bombs and high explosives, poison gas and decontamination, first aid, civilian conservation and salvage, nutrition in the war-time emergency, and a selected critical bibliography. Information in each chapter is comprehensive, yet concise, and should be known by every citizen during this war. If enough people absorb and remember the principles set forth in the sections on fire-fighting, first aid, civilian conservation and nutrition, we may become a wiser and healthier nation long after the fighting is over.

Incidentally, all royalties derived from the sale of this book go to the Civilian Defense Council of the College of the City of New York in furtherance of civilian defense activities. The authors have accordingly waived their royalties.

URANIUM AND ATOMIC POWER. By *Jack De Ment* and *H. C. Dake*. Published by Chemical Publishing Co., Brooklyn, N. Y. 335 pages. Price $5.

Reviewed by *F. C. Nachod*

IT SEEMS adequate to let the authors state the purpose of their book in their own words: "We believe that we are treating some of the fundamentals of a new science which includes, but which does not entirely consist of, the rapidly vanishing borderline between chemistry and physics. We also believe that we have described what may be the groundwork of a future industry, the possibilities of which are fantastic to many but not too highly improbable to those with a mind to progress."

There is quite a mixture of atomic physics, mineralogy, and analytical chemistry combined in this book. The chapters deal with atomic power, the uranium minerals, prospecting for uranium minerals, the physics and chemistry of uranium, and finally, specific and special methods of uranometry. A diligent reader will possibly glean information out of this collection.

The reviewer was often reminded of the style of popular magazines, and he was therefore not always aware of studying a scientific treatise. The following quotations may illustrate this (page 19): "A new world of scientific

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BACK NUMBERS

★ Limited quantities of back numbers of Chem. & Met. are available. Issues which may be obtained at the regular price of 35 cents per copy are those of December 1941 to April 1942 inclusive. Copies of the May 1942 issue containing the special report on diffusional operations may also be obtained at one dollar each.

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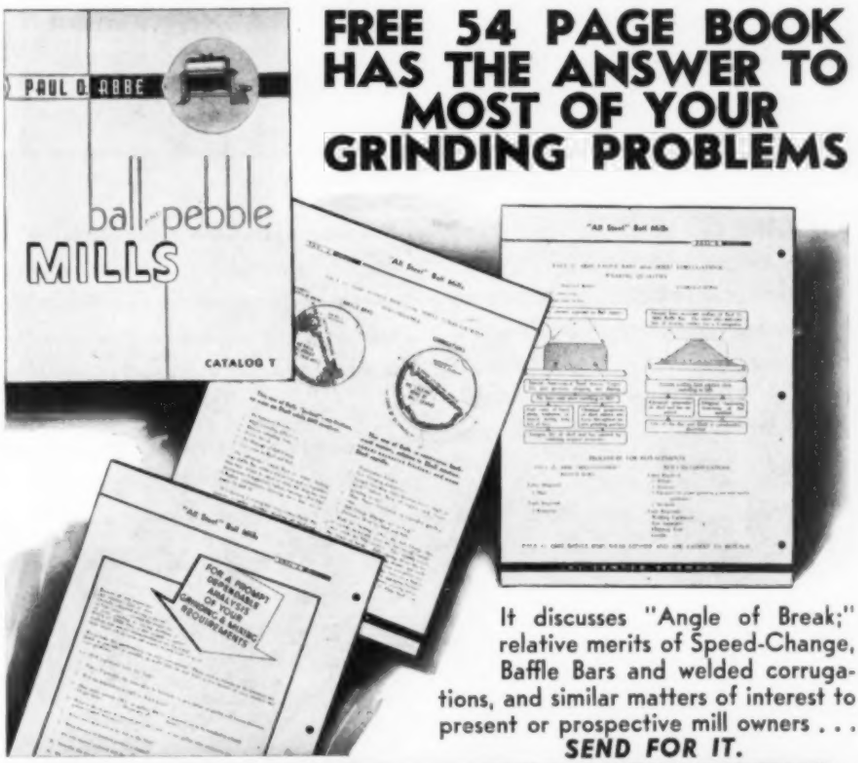

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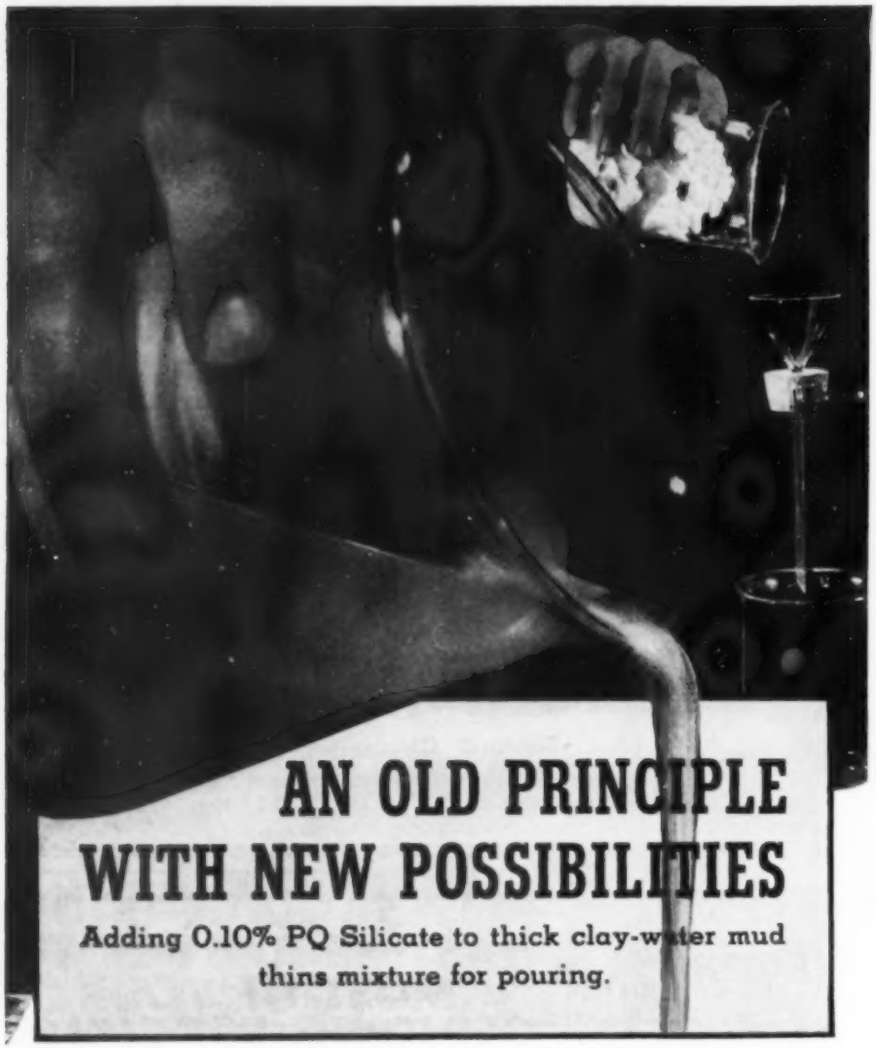

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knowledge is about to be revealed"; on page 20: "In view of the past achievements of science, it is probably safe to predict that some day atomic power will be an actuality"; on page 22 "We will not contemplate the appalling possibilities of atomic gunpowder in warfare." Such passages and prophesies are found quite frequently throughout the book.

Taken with a grain of salt, the book by Messrs. De Ment and Dake will make good reading.

POST-WAR PLANNING IN THE UNITED STATES. By *George B. Galloway.* Published by The Twentieth Century Fund, New York, N. Y. 158 pages. Price 60 cents.

THIS report is a review of all of the public, quasi-public, and industrial projects which the author has been able to discover in which post-war planning research is in progress. The material is classified by the agency which is doing the research and by the fields of planning in which the research is being carried out. An extended bibliography is included.

This book is not in any sense a critical interpretation of the significance of results being obtained. It is merely a listing with brief description of the type of activity, personnel, and publications which will interest those engaged in any phase of the effort to plan for the post-war era. The report is confined to projects which are either primarily concerned with United States affairs or which involve American participation.

The Twentieth Century Fund requests that those interested in this subject keep it informed of all new developments so that subsequent editions of this monograph may be as comprehensive as possible in reporting all different types of such activity within the United States.

THE PHYSICAL EXAMINATION OF METALS. Vol. II. By *Bruce Chalmers* and *A. G. Quarrell.* Published by Longmans, Green and Co., New York, N. Y. 280 pages. Price $6.

Reviewed by *C. B. F. Young*

THE AUTHORS have compiled many methods used in testing metallurgical specimens. Speaking broadly, all tests given may be classified as electrical in nature. An attempt has been made to give the scope, limitations, and uses of all methods. The subjects covered include magnetism and its applications for testing irregularities and flaws in magnetic and non-magnetic materials; electrical measurements used in the determination of thicknesses of deposits and resistances of base metals; crystal size and orientation as determined by X-rays and metallurgical applications of X-ray diffraction methods; recent applications of electron diffraction and interpretation of results; the electron microscope and radiography.

Appendix I deals with the electrolytic polishing or brightening of metals and alloys which is rather elementary. The second appendix gives some interesting

data on the crystalline structure of metals.

The book is recommended for those who desire to have a well rounded knowledge of the many different methods used in testing metals.

OUTLINES OF FOOD TECHNOLOGY. By *Harry W. von Loesecke.* Published by Reinhold Publishing Corp., New York, N. Y. 505 pages. Price $7.

DESPITE its 505 highly condensed pages, this volume on food technology is, as its title implies, an outline—not a treatise. Many of its 15 chapters could be expanded into entire volumes or a series of volumes without exhausting their subject matter. From which it may be inferred that the work is a beginner's text rather than a reference work for men in industry, except as a point of departure.

The author has wisely minimized the historical aspects of the technology of an industry that is almost as old as mankind. By confining himself to the current developments of recent years he has afforded needless resurrection of the task. Highly commendable is the bibliography of suggested reading matter at the close of each chapter, which will partially compensate for the absence of detailed discussion, those who consult it as a reference work.

To a chemical engineer who knows his unit operations and unit processes, and is after detailed information about limitations imposed by inherent characteristics of food, the volume will be occasionally helpful. It is, however, a chemist's book, not a chemical engineer's. Treatment of subject matter is arranged by type of food, not by function. Curiously, however, the author includes dehydration as a preservative function under canning of vegetables, yet has a separate chapter on freezing as a method of preservation.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. In ordering publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, express order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, pamphlet is free and should be ordered from Bureau responsible for its issue.

Alphabetical List of Simplified Practice Recommendations. Bureau of Standards, Letter Circular LC-687; mimeographed.

Devices for Air Raid Warnings. Bureau of Standards, Letter Circular LC-685. Mimeographed.

Dead Storage of Automobiles. Bureau of Standards, Letter Circular LC-684. Mimeographed.

General Tables of Weights and Measures. Bureau of Standards, Letter Circular LC-682. Mimeographed.

Units and Systems of Weights and Measures, Bureau of Standards, Letter Circular LC-681. Mimeographed.

Incandescent Electric Lamps: Photometric Standards Distributed by the National Bureau of Standards, Bureau of Standards, Letter Circular LC-680. Mimeographed.

Performance Test of Floor Coverings for Use in Low-Cost Housing: Part 4, by Percy A. Sigler and Elmer A. Koerner, Bureau of Standards, Building Materials and Structures Report BMS80. Price, 15 cents.

Low-Cost Glazes for Structural Clay Products, by Ray T. Stull and Paul V. Johnson. Bureau of Standards, Circular C436. Price, 10 cents.

Paints, Varnishes, and Related Products. (Colors, Shades, and Containers.) Bureau of Standards, Simplified Practice Recommendation R144-42. Price, 5 cents.

Physical Properties of Dental Materials, by Wilmer Souder and George C. Paffenbarger. Bureau of Standards, Circular C433. Price, 75 cents.

Occupational Hazards to Young Workers. Report No. 1, The Explosives-Manufacturing Industries. Childrens Bureau Publication No. 273. Price, 10 cents.

Productivity and Unit Labor Cost in Selected Manufacturing Industries, 1919-1940. Bureau of Labor Statistics, unnumbered documents, Mimeographed.

Colleges and Universities, Part 3 of Educational Directory, by Ella B. Ratcliffe and Elsie J. Smith. U. S. Office of Education. Price, 15 cents.

Fuel Wood Used in the United States, 1630-1930, by R. V. Reynolds and Albert H. Pierson. Department of Agriculture, Circular No. 641. Price, 5 cents.

Vegetable Seed Treatments, by R. J. Haskell and S. P. Doolittle, Department of Agriculture, Farmers' Bulletin No. 1862. Price, 5 cents.

Boron Distribution in Soils and Related Data, by Richard R. Whetstone, William O. Robinson, and Horace G. Byers. Department of Agriculture, Technical Bulletin No. 797. Price, 10 cents.

Index of United States Army and Federal Specifications Used by the War Department, January 1942. Price, 30 cents.

Security for Industrial Plants. Navy Department unnumbered pamphlet. Price, 10 cents.

National Resources Development, Report for 1942. National Resources Planning Board. Gives summary of post-war planning studies and other projects including some important findings. Price, 55 cents.

Income Tax Depreciation and Obsolescence Estimated Useful Lives and Depreciation Rates. Bureau of Internal Revenue, Bulletin "F". Price, 15 cents.

Cinnabar-Reduction Plants of the Southwestern Arkansas Quicksilver District, by S. M. Shelton and W. A. Calhoun. Bureau of Mines, Report of Investigation 3627. Mimeographed.

Federal Specifications. The following Federal Specifications may be obtained from the Superintendent of Documents Government Printing Office, Washington, D. C., at 5 cents each: Denture-Base-Material (Acrylic Resin or Mixtures of Acrylic and Other Resins), U-D-226. Benzol (Benzene); technical-grade, VV-B-231. Ultramarine-Blue; dry, Paste-in-Japan, Paste-in-Oil, TT-U-451a. Calcium-Chloride (For Road and Building-construction), O-C-106. Aluminum-Pigment; Powder and Paste, (For) Paint, TT-A-468. Grease; Lubricating, Graphite, VV-G-671a. Oil; Typewriter, VV-O-836. Wax; Paraffin, VV-P-121. Oil, Castor; Technical-Grade, JJJ-O-318.

Outline of Form for Federal Specifications. Treasury Department, Federal Standard Stock Catalog, Section IV, Part 2. Price, 5 cents.

Industrial Alcohol 1942. Bureau of Internal Revenue, Treasury Department, Regulations 3. Price, 40 cents.

The following modifications of normal specifications have been prepared to save scarce materials. They are available from the Federal Catalog Division, Procurement Division Building, Washington, D. C. Felt; Coal Tar Saturated, (For) Roofing, and Waterproofing, E-HH-F-201. Tires, Pneumatic, Automobile and Motorcycle, E-ZZ-T-381d. Tubing; Rubber, E-ZZ-T-831b.

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MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterhead.

Activated Carbon. Darco Corp., Wilmington, Del.—14-page pamphlet entitled "Eight Ways to Get the Most from Darco". Discusses briefly the use of this concern's activated carbon in wartime, choosing the right grade of carbon, counter-current usage, etc. Includes graphs and illustrations.

Belting Maintenance. The B. F. Goodrich Co., Akron, Ohio—Catalog Section 2800—24-page bulletin entitled "Care and Maintenance of Conveyor and Elevator Belting". Also contains a wide range of belt data, valuable when considering installation or repair problems. Discusses belting wear at loading points, making conveyor belts run straight, vulcanized splices and repairs and how to install conveyor belts.

Blackout Control. Automatic Switch Co., 41 E. 11th St., New York, N. Y.—A series of letters dealing with the use of this concern's products for blackout control for war bases, large plants, and for multiple street lighting and highway lighting. Gives technical information on the various methods that can be used and the advantages of each. Also includes considerable information on this concern's line of remote control switches.

Blowers. The Herman Nelson Corp., Autovent Fan & Blower Division, Chicago, Ill.—Catalog 303, Part I—20-page bulletin describing the line of centrifugal blowers put out by this concern. Extensively illustrated with photographs. Text explains construction features, bearings and performance characteristics, etc.

Chemicals. Monsanto Chemical Co., St. Louis, Mo.—Bulletin 120—10-page booklet on "Santopour", this concern's pour-point depressant for lubricating oils. Contains a general description of the product, its applications, effect on properties of oils, tests in automotive engines, service results, shipping containers, tax classification, and similar information. Contains numerous graphs showing reduction of pour-point.

Chemicals. Paragon Testing Laboratories, Orange, N. J.—List 3—30-page catalog giving the price and listing by code and name the line of fine organic chemicals put out by this concern. The catalog is divided into two parts. The first is devoted to fine organic chemicals, while the second is devoted to spot test reagents as described by Feigl.

Circuit Breaker. Roller-Smith Co., Bethlehem, Pa.—Catalog 2150—12-page booklet describing and illustrating the line of low-voltage air circuit breakers put out by this concern and designed for use on alternating current circuits up to 600 volts and direct current circuits of 250 or 750 volts. Lists closing and tripping currents, shows typical methods of making connections to large breakers, gives dimensions of both manual and electrical designs and indicates number and size of the terminals for various capacity breakers. Extensively illustrated by drawings showing outlined dimensions of the various units.

Circuit Breakers. Roller-Smith Co., Bethlehem, Pa.—Catalog 3130—12-page catalog which describes in detail and illustrates this concern's line of small oil circuit breakers for use on alternating current circuits in industrial plants and power houses where interrupting capacities of 50,000 Kva. are required. Contains diagrammatic sketches, control diagrams, outline dimensions and tables of engineering data.

Conical Mills. Hardinge Co., York, Pa.—Bulletin 13D—28-page extensively illustrated bulletin which describes the line of conical mills put out by this concern, their use in various operations, etc. Contains cross-sectional drawings and tables of engineering data.

Construction Material. Johns-Manville, 22 East 40th St., New York, N. Y.—Form TR29A—4-page folder which describes briefly and illustrates this concern's "Transite" movable asbestos walls for speedy construction of offices in industrial plants.

Control Instruments. Automatic Temperature Control Co., Inc., 34 E. Logan St., Philadelphia, Pa.—Catalog A14—12-page catalog describing and illustrating this concern's full line of electric motor valve operators as applied to standard temperature control systems for fuel-fired furnaces. Includes extensive tabulating data, wiring diagrams, recommendations for use of various units, dimensions and related information.

Control Instruments. The Esterline-Angus Co., Inc., Indianapolis, Ind.—Bulletin 1041—4-page folder which describes how costs have been reduced and performance improved with electric furnaces by graphic wattmeters put out by this concern. Illustrated by photographs. Also folder listing available publications of this concern which give case histories on the use of graphic instruments.

Control Instruments. Sarco Co., Inc., 475 Fifth Ave., New York, N. Y.—Bulletin 600—16-page catalog dealing with this concern's temperature regulators for heat control in various industries. Each unit is illustrated and described, with dimensions given in chart form. Includes information on list prices and shipping weights. Includes cross-sectional and diagrammatic drawings and charts on valve capacities.

Control Instruments. Taylor Instrument Cos., Rochester, N. Y.—Catalog 76JF—24-page catalog dealing with this concern's indicating, recording and controlling instruments for pressure. Each unit is illustrated and described briefly, with information on use and selection of instruments. Also contains tables on charts for recorders and controllers.

Conveyors. Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.—Booklet 2075—32-page illustrated catalog on this concern's "Bulk-Flo" elevator-conveyor of two sizes. Power formulas, engineering data, diagrams showing paths of operation, and data on sizes, capacities and dimensions are included.

Crushing. Pennsylvania Crusher Co., Liberty Trust Building, Philadelphia, Pa.—Circular 6010—Folder which illustrates and explains briefly operating principles of this concern's new type of reduction unit, called the "Reversible Impactor", which reduces by compression, impact, attrition, and shear.

Die Castings. Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.—26-page booklet which illustrates extensively and describes very briefly the use of this concern's die castings for conserving metals, machines and manpower in various war production industries. Gives chemical composition and physical properties of various alloys put out by the concern.

Dust Collector. American Foundry Equipment Co., 555 So. Byrkit St., Mishawaka, Ind.—Catalog 82—Spiral-bound catalog giving information on mechanical features and specifications of this concern's high efficiency cyclone dust collector. Explains construction, operating details and technical layouts. Contains engineering tables and charts useful in planning applications of dust control units.

Electrical Equipment. Keystone Carbon Co., Inc., St. Marys, Pa.—Catalog K15—24-page catalog illustrating, describing and listing the line of industrial slip ring, motor and generator brushes, metal graphite and carbon products put

out by the concern. Includes specification data and list prices.

Electrical Equipment. Westinghouse Electric & Mfg. Co., East Pittsbugh, Pa.—Catalog 30000—64-page, 1942 revision of the "Quick Selector Catalog" issued twice yearly. General subjects covered include safety switches, multibreakers, panelboards, motor control and motors, etc. Contains new application data and revised information on selection of correct equipment for each purpose.

Equipment. The Cleveland Crane & Engineering Co., 1129 E. 283rd St., Wickliffe, Ohio—Vol. 1, No. 1 of this concern's house organ entitled "Cleveland Crane Graphic" which will be devoted to the products of this concern's crane, tramrail, and steelweld divisions. Extensively illustrated.

Field Generators. Century Electric Co., 1806 Pine St., St. Louis, Mo.—Form BCA120-80—4-page form which illustrates by photograph and describes briefly the various types of revolving field generators put out by this concern. Capacities range from 7.5-75 kva.

Flow Indicators. S. F. Bowser & Co., Inc., Fort Wayne, Ind.—8-page folder illustrating and describing briefly this concern's line of flow indicating devices of various types. Includes information on design, uses, specifications, and sizes and dimensions. Includes photographs and cross sectional drawings.

Fluorescent Lighting. Swedish Iron & Steel Corp., 17 Battery Place, New York, N. Y.—A. I. A. File No. 31F—88-page bulletin which deals with cold cathode fluorescent lighting. One section deals with the progress of artificial lighting, while another discusses cold cathode lighting design. Other sections deal with manufacturing cold cathode tubes, abbreviations and definitions of terms, and useful tables. Contains considerable engineering data in text, table, chart and drawing form. Extensively illustrated.

Gas Engines. Worthington Pump & Machinery Corp., Harrison, N. J.—Bulletin S-550-B20—8-page folder describing and illustrating this concern's line of "BBG" gas engines of the vertical 4-cycle, totally inclosed type. Contains cross-sectional drawings and dimensions.

Glass-Lined Tanks. The Pfaudler Co., Rochester, N. Y.—Bulletin 815—New bulletin describing this concern's line of "Junior Series" glass-lined mixing and storage tanks, ranging in capacity from 5-100 gal. Gives considerable information on each of the types and sizes available.

Heat Treatment. The Lithium Corp., Raymond-Commerce Bldg., Newark, N. J.—8-page folder dealing with "Lithco", this concern's chemically-neutral heat treating process and "Lithcarb", for fast, bright gas-carburizing. Includes a discussion of the principles and chemistry of the two processes, their outstanding features and advantages. Includes flow diagrams and charts on the two processes.

Hydroclassifiers. Denver Equipment Co., 1400-17th St., Denver, Colo.—Bulletin C4AB—8-page folder which describes briefly and illustrates by photograph and cross-sectional drawings the line of hydroclassifiers put out by this concern. Describes operation, superstructure, drive, etc. Includes a chart on capacities and dimensions.

Indicating Instruments. The Foxboro Co., Foxboro, Mass.—Bulletin A305—New Bulletin presenting the complete line of this concern's potentiometer temperature indicators and indicating resistance thermometers. Illustrates and describes single-point and multiple-point models, etc. Discusses and describes constructional features of the instrument.

Industrial Cleaning. L & R Mfg. Co., 54-56 Clinton St., Newark, N. J.—8-page folder dealing with this concern's industrial cleaning machines and solutions for cleaning of small units such as instruments, meters, gages, bearings, etc. Contains a discussion of the principles of the machines and their operations as well as methods for precision cleaning of small industrial units. Illustrated.

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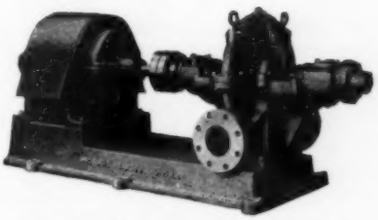

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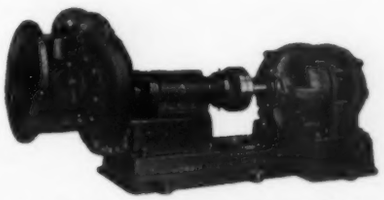

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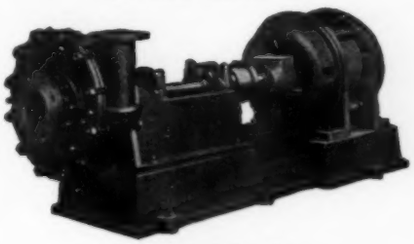

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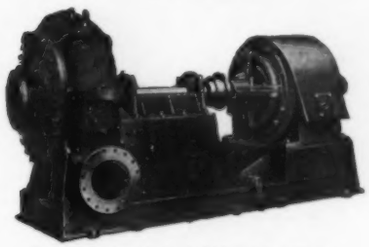

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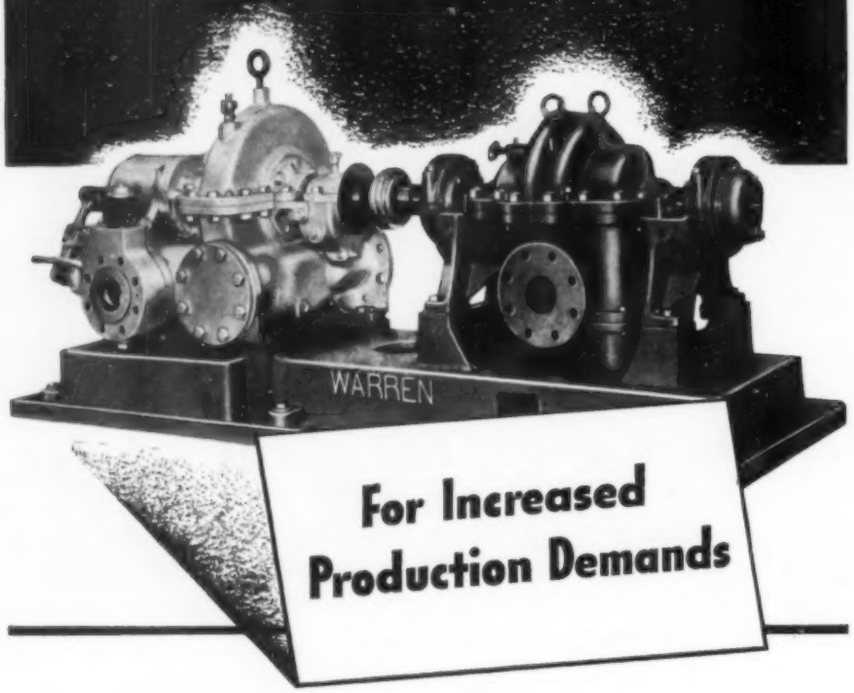

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Industrial Engineering Service. The Bedeaux Co., Inc., Chrysler Building, New York, N. Y.—16-page pamphlet entitled "More Production, Better Morale," which describes the principle of industrial engineering service developed by this concern, the need for such service at a time when production is vital, principles of work measurement and production control, protection for the worker, method improvement and simplification, etc.

Industrial Finishes. Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.—Booklet on U. S. Government specification finishes. Provides makers of armament products with essential information on this concern's finishes that conform with various U. S. Government specifications.

Industrial Lighting. Benjamin Electric Mfg. Co., Des Plaines, Ill.—Lighting Manual entitled "Benjamin Specifications for Productive Lighting in War Plants" designed to give latest information on the use of lighting for solving problems of production, rejects, employee fatigue, accidents, etc. Gives solutions for 21 lighting problems most commonly encountered in plants converted to war production. Written in non-technical language and illustrated by means of diagrams and layouts.

Instrument Conservation. Manning, Maxwell & Moore, Inc., Bridgeport, Conn.—Three two-page folders dealing briefly with the maintenance of thermometers and control instruments, globe valves, and safety and relief valves. Contain practical hints on installation, maintenance and proper operation of these instruments.

Laboratory Ovens. Despatch Oven Co., Minneapolis, Minn.—Bulletin 105—4-page folder illustrating and describing briefly this concern's laboratory ovens of the forced draft type. Includes information on parts and a table of dimensions.

Light Oil Products. Crowley Tar Products Co., 271 Madison Ave., New York, N. Y.—Chart showing the latest approved specifications for the coke oven light oil products put out by this concern. Includes data on benzols, toluols, xylols, refined solvent naphthas, and crude solvent naphthas.

Lubrication. National Graphite Co., Inc., 17 John St., New York, N. Y.—Bulletin 4—4-page folder which deals with this concern's colloidal natural graphite additive for lube oils and other greases for lubrication purposes. Describes briefly the product, properties and uses. Includes a price list.

Lubrication. Trabon Engineering Corp., Cleveland, Ohio—Bulletin 423—4-page folder dealing with this concern's reversing lubricating system of the centralized type which uses no springs, diaphragms, packing or exposed moving parts. Illustrated.

Mechanical Seal. Stevenson Engineering Corp., 45 Willard Ave., Providence, R. I.—Bulletin 1—4-page folder which announces and describes this concern's "Sealol" balanced pressure seal, rotary type. Includes brief descriptive matter, cross-sectional drawings, and a table of dimensions and specifications.

Metallizing. Metallizing Engineering Co., Inc., 21-07 - 41st Ave., Long Island City, N. Y.—Bulletin 42A—16-page Bulletin describing this concern's metallizing process and equipment. Tells how to eliminate replacement, increase life of equipment, and reduce maintenance by use of this process.

Mixing. American Machine and Foundry Co., 511 Fifth Ave., New York, N. Y.—8-page folder dealing with this concern's "AMF Glen Mixers" using the planetary mixing principle and equipped with variable speed and interchangeable agitators and portable bowls. Contains data on specifications and capacities. Extensively illustrated by photographs and drawings.

Motors. Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.—Leaflet 117—4-page folder which announces and describes this concern's new "Cowl-Cooled" squirrel-cage, fan-cooled motor either small or sleeve bearing equipped. Specially designed for dusty locations and all applications where totally-in-

closed motors are used. Illustrates the unit by photograph, cross-sectional views, and drawings of dimensions. Includes a table of ratings.

M. T. D. Calculator. American Locomotive Co., Alco Products Division, 30 Church St., New York, N. Y.—Sturdy, cardboard M. T. D. calculator to help in approximation of heat transfer surfaces in preparing estimates for heat exchange equipment. Includes scales for calculation of logarithmic M. T. D. as well as correction factors for one, two, three and six shell passes, and also C & D scales which permit multiplication and division operations. For the majority of heat exchanger work, the calculator is about 95 percent accurate.

Oil Purifier. The Sharples Corp., 2300 Westmoreland St., Philadelphia, Pa.—4-page form describing this concern's oil purifier especially designed for diesel fuel and lubricating oil and turbine lubricating oil. Describes the unit, its capacity, operation and installation. Gives cross-sectional drawings and engineering data on capacity and specifications.

Power Distribution. General Electric Co., Schenectady, N. Y.—Bulletin GEA-3759—8-page folder giving information on selection and the proper arrangement of "Load-Center Distribution System to Fit Individual Requirements of Industrial Plants". Describes characteristics of the four load-center system basic circuit arrangements, the simple radial circuit, the primary selective circuit, the secondary selective circuit, and the secondary network arrangement.

Pulverizers. Raymond Pulverizer Division, Combustion Engineering Co., Inc., 1315 N. Branch St., Chicago, Ill.—Bulletin 52—8-page folder illustrating and describing briefly this concern's line of pulverizing and separating equipment, including mills, pulverizers and air separators for the production of powdered materials by dustless operations.

Pumps. Blackmer Pump Co., Grand Rapids, Mich.—Bulletin 301—6-page folder giving condensed information on the line of rotary pumps put out by this concern. Each unit is illustrated and briefly described.

Pumps. The Watson-Stillman Co., Roselle, N. J.—Bulletin 270A—8-page folder which illustrates and describes briefly the high pressure, motor-driven, horizontal pumps and two-plunger steam pumps put out by this concern. Gives specifications of the various types.

Pumping Control. The Foxboro Co., Foxboro, Mass.—Bulletin B294—8-page folder describing and illustrating the line of units put out by this concern for electric-operated pumping control of the recording and indicating type. Includes photographs of the unit and their installation and cross-sectional drawings.

Reconditioned Machinery. Morse Bros. Machinery Co., Denver, Colo.—List 421—32-page catalog listing the reconditioned machinery available from this concern. Lists mining, milling and smelting machinery, electric motors, ball and rod mills, conveyors, crushers, agitators, pumps, filters, etc. Illustrated.

Redwood. California Redwood Association, 405 Montgomery St., San Francisco, Calif.—8-page bulletin entitled "Stepping Up War Production with Redwood" which illustrates extensively and describes briefly the various uses of redwood for Army, Navy and various industrial uses. Shows use of this wood for buildings, pipelines, gasoline plants, liquid storage tanks, food processing tanks, cooling towers, sewerage disposal equipment, etc.

Resistors. Keystone Carbon Co., Inc., St. Marys, Pa.—4-page folder describing this concern's negative temperature coefficient resistance material. Describes practical applications, standard sizes and wattage ratings, methods of changing resistance and uses of negative coefficient resistant material.

Rubber Conservation. The Manhattan Rubber Mfg. Div., Raybestos-Manhattan Inc., Passaic, N. J.—Two wall charts on the proper care of rubber hose. One of the cards is devoted to the proper care of fire hose and the other lists rules for the proper care of air, water, steam and other types of rubber hose and proper attaching of couplings.

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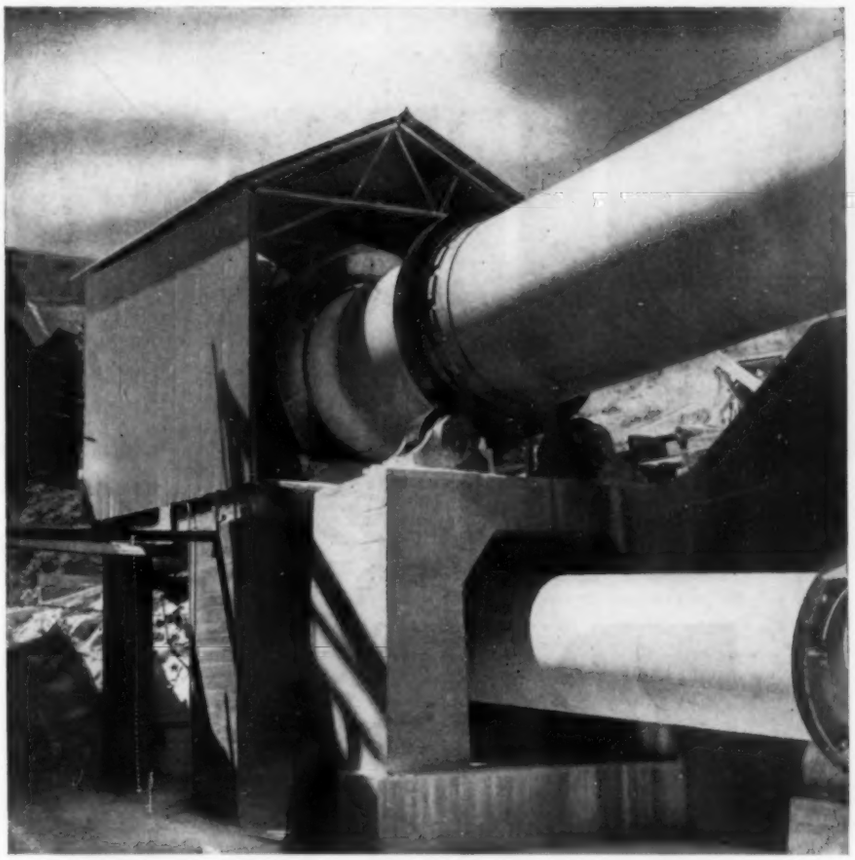

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LARGE CONSUMING INDUSTRIES SHOW LITTLE CHANGE IN MONTHLY REQUIREMENTS FOR CHEMICALS

CHEM & MET ECONOMICS & MARKETS

THE index of the Federal Reserve Board continues to report a rising curve for all manufacturing production but data bearing on the industries which are the largest consumers of chemicals indicate a stabilization of operations with monthly changes in output varying more in accordance with the number of working days than because of changes in operating rates. Oil refineries offer an exception to the general rule with daily runs to stills in April and May recording an appreciable decline from those of the preceding month. Paper mills also have dropped off from the levels maintained in previous months. Steel outputs were advanced in May but other industries appear to have gone along on an even keel.

Chem. & Met. Index for Industrial Consumption of Chemicals

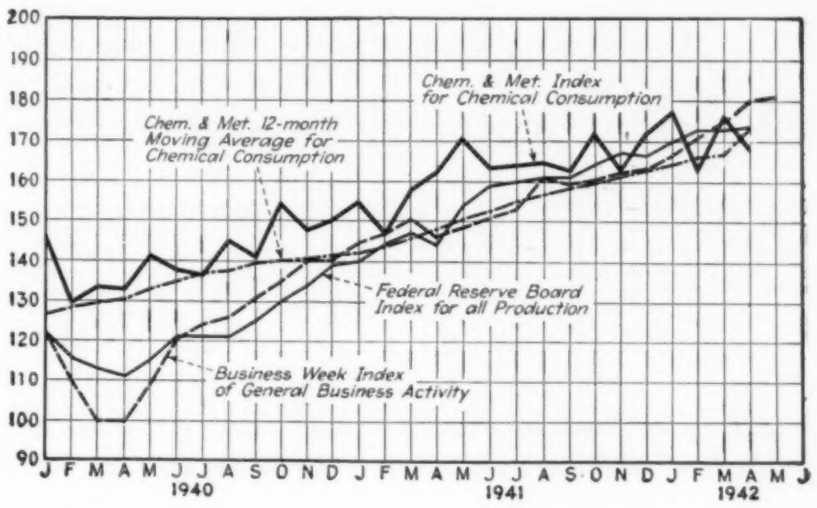
1935=100

	March	April
Fertilizer	37.58	36.00
Pulp and paper	23.35	22.42
Petroleum refining	14.51	13.70
Glass	16.65	16.70
Paint and varnish	15.61	16.40
Iron and steel	13.52	13.13
Rayon	15.24	14.68
Textiles	12.20	12.50
Coal products	9.80	9.51
Leather	5.10	4.97
Industrial explosives	5.22	5.99
Rubber	3.00	3.00
Plastics	4.60	4.43
	176.38	173.43

The index for chemical consumption for April is 173.43 compared with 176.38 for March. Last year the index for March was 158.28 and for April 161.96. The Department of Labor index for employment in chemical plants for April is 192.9 as against 192.5 for March which would indicate but little change in production schedules. Data so far available for May point to a further drop in activities at oil refineries and at paper mills. With the mixing season practically over, outputs at fertilizer plants also are tapering off and this is reflected in smaller outputs of superphosphate. Glass mills are gaited to high outputs of window glass and containers with plate production at a low level. Production of coal-tar chemicals is being pushed as many of these products are in the very essential classification. Sales of soap have been surprisingly large in view of the record distribution of last year. Stocks are reported to be large but the inclusion of soap among lend-lease materials makes it probable that export shipments will become more prominent.

While it is not possible to obtain figures representative of the amounts of chemicals which are going directly to the war industries, it is apparent that such deliveries are steadily gaining in volume. In the first place it has been announced that the first part of the aluminum program was completed ahead of schedule. This has a particular bearing on consumption of soda ash. Data regarding requirements for alcohol for the current year give some idea of the progress made in getting smokeless plants into operation. The many chemicals which were placed under full allocation control in the last month are another indication of the necessity of reserving larger parts of production for war needs. As the aviation gasoline and synthetic rubber industries get into full production the supply of chemicals may be further curtailed although new production of chemicals are a part of the program in each of these cases. The rising trend for consumption of chemicals in direct war work, however, makes it clear that total production has increased much more sharply than is indicated by the index for consumption in industrial lines.

Among the materials which after July 1, will under full allocation control is chemical cotton pulp. From July forward deliveries may not be made except as specifically authorized by the Director of Industry Operations. The order states that demands for chemical cotton pulp for military purposes are growing steadily, and while no critical shortage exists at present, the allocation control is instituted to direct available supply into vital munitions manufacture and to prevent its use for commercial purposes where substitutes are available. High alpha sulphite wood pulp can be substituted for many such purposes. This order has aroused considerable speculation regarding the amount of cotton linters which will be made available for the rayon and plastics industries.

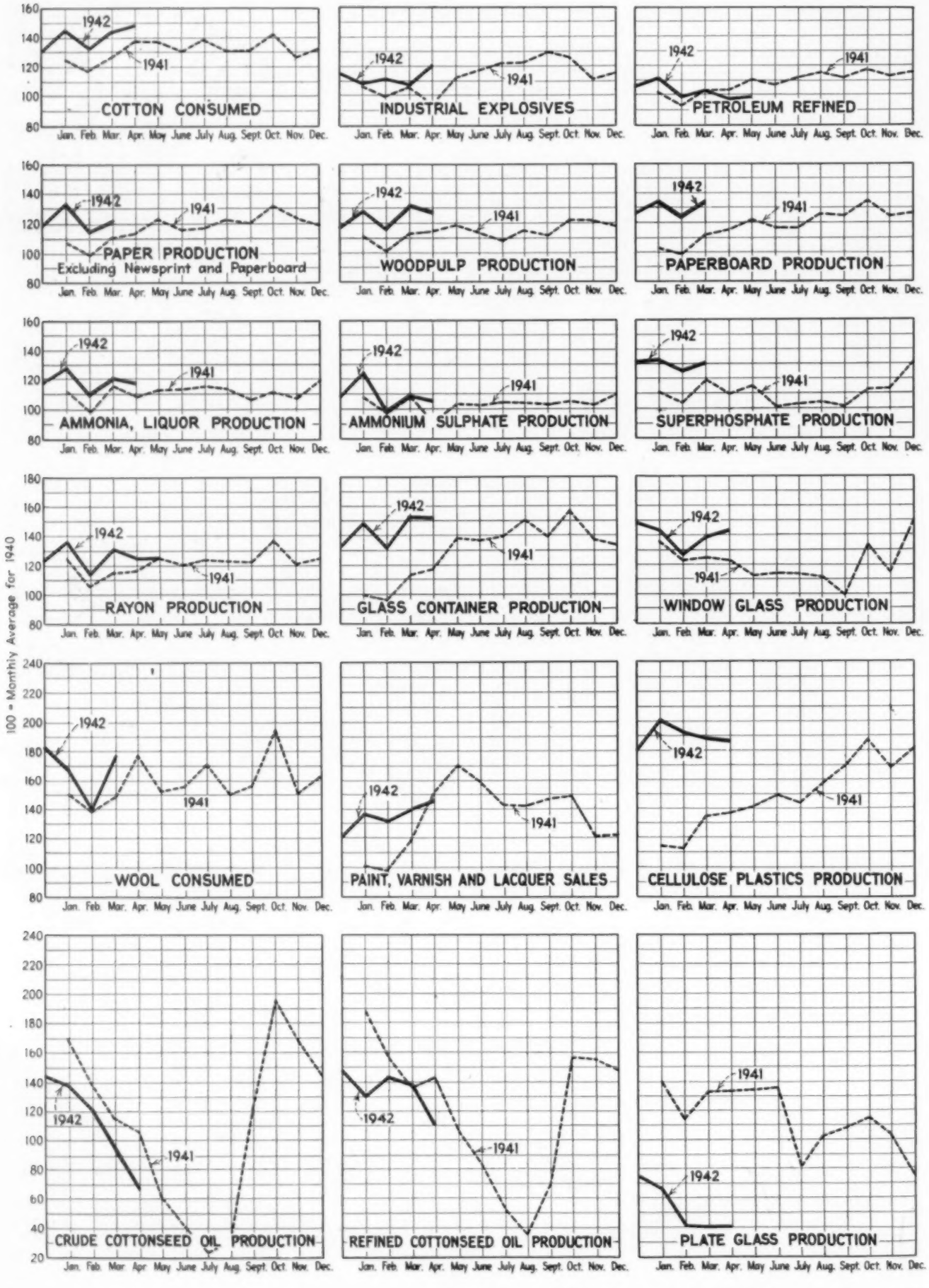


Production and Consumption Data for Chemical-Consuming Industries

	April 1942	April 1941	January-April 1942	January-April 1941	Percent of gain for 1942
Production					
Ammonia liquor, 1,000 lb.	5,640	5,167	22,429	20,665	8.5
Ammonium sulphate, tons	63,766	57,916	253,128	245,469	3.1
Creosote oil, 1,000 gal.	3,261	3,052	12,497	11,140	12.2
Byproduct coke, 1,000 tons	5,069	4,480	20,208	18,931	6.8
Glass containers, 1,000 gr.	6,921	5,325	26,576	19,338	37.4
Plate glass, 1,000 sq. ft.	5,570	18,344	25,878	71,625	63.9*
Window glass, 1,000 boxes	1,644	1,400	6,323	5,775	9.5
Cellulose acetate plastics, 1,000 lb.					
Sheets, rods, and tubes	568	402	2,239	1,827	22.6
Molding composition	3,607	2,255	14,517	7,997	81.5
Nitrocellulose plastics, 1,000 lb.	1,415	1,420	5,843	5,026	16.3
Rayon, yarns, 1,000 lb.	38,800	35,900	155,900	137,900	13.1
Consumption					
Cotton, bales	998,754	920,950	3,805,039	3,413,984	11.4
Industrial explosives, 1,000 lb.	41,045	31,986	151,899	137,419	10.5
Cottonseed oil, bbl.	217,545	401,754	974,649	1,387,620	29.8*

*Percent of decline.

Production and Consumption Trends



IT'S ON THE JOB NOW!

Armstrong's Mineral Wool Board Insulation

OFFICIALLY it is only a month old—this newest addition to Armstrong's line of low temperature insulations. Unofficially, however, Armstrong's Mineral Wool Board has been on the market for several months. Over two hundred actual installations have been made, with Armstrong engineers constantly checking to be certain that this new material was structurally right. That final approval—plus the endorsement of Armstrong's Laboratory—had to come before this product was accepted as a *permanent* addition to the Armstrong Line. Now it's on the job, bearing the Armstrong name, fully endorsed for practical, reliable performance.

The following summary of physical characteristics indicates why Armstrong's Mineral Wool Board is so well suited to most low temperature applications:

Composition: Basically mineral wool with a waterproof binder, processed and cut to size.

Insulating Efficiency: Its thermal coefficient is 0.33 at 75° F., and in all respects it equals or exceeds requirements of Federal Specification HH-M-371 for board or block form insulation.

Moisture-Resistance: Both the mineral wool and the binder are waterproof.

Structural Strength: It is self-supporting and will stay permanently in place. Will not sag, settle, shrink, swell, or warp.

Odor: Armstrong's Mineral Wool Board is free from objectionable odor and from any liability to rot or mold, or harbor vermin.

Erection: It is readily handled and erected by available labor and with ordinary tools. Application methods are essentially the same as for corkboard.

Bond with Finishing Materials: Either Armstrong's Asphalt Emulsion Plastics or portland cement plaster takes a firm bond on Armstrong's Mineral Wool Board.

Sizes: Boards are made 12″ x 36″ and in 1″, 1½″, 2″, 3″, and 4″ thicknesses. (Regranulated Mineral Wool is available.

GET COMPLETE SPECIFICATIONS NOW

The story of Armstrong's new Mineral Wool Board and complete specifications for its erection are contained in this new booklet. It also contains data on design standards for all ordinary low temperature installations. Why not send for your free copy today and find out how this efficient new material can help solve your insulation problem? Just write to Armstrong Cork Company, Building Materials Division, 919 Concord Street, Lancaster, Pennsylvania.

ARMSTRONG CORK COMPANY

Insulation Headquarters

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*Reg. U. S. Pat. Off. O.-C. F. Corp

HEAT-FAG and ACCIDENTS
Ride Together

AVOID HEAT-FAG—USE
MORTON'S SALT TABLETS

SALT LOSS *Slows Up Production*

Salt lost by sweating must be replaced or workers tire quickly — accuracy and alertness are dulled. Lowered efficiency, mistakes and accidents take their toll.

MORTON'S Salt Tablets

Install Morton's Dispensers by all drinking fountains, so workers can take tablets to replace the salt lost by sweating.

ORDER NOW!

Salt Tablets, Case of 9000 - $2.60
Salt-Dextrose Tablets, Case of 9000 - - - - - $3.15

Dispensers
500-tablet size - - - - - $3.25
1000-tablet size - - - - - $4.00

MORTON SALT COMPANY, Chicago, Ill.

WRITE FOR FOLDER

Designed Especially for the **PROCESS INDUSTRIES**

Made in sizes for every plant requirement

Positive action—slow speed

Bump Pumps do not depend upon excessive speed for constant and positive delivery. They will handle thin or viscous liquids under pressures and vacuums, and liquids with temperatures up to 210° can be successfully handled by all standard models. Stainless steel construction—nickel alloy, bronze or iron. Also made in pulley models and gear driven. No agitation —Large internal chambers—long sealing surfaces—practical and very economical for pumping.

The BUMP PUMP CO.
LA CROSSE • WISCONSIN

GOVERNMENT PLACES MORE IMPORTANT CHEMICALS UNDER FULL ALLOCATION CONTROL

As a result of the steadily increasing demand for materials essential to the war program, the amount of chemicals available for non-essential uses is becoming more restricted and the number of chemicals placed under full allocation control is expanded. Toluol which already had been under control has been further affected by an amendment which directs that every person who cokes coal or processes oil, operate his plant so that the maximum amount of toluol will be produced. It further forbids the sale or delivery of oils containing toluol until the maximum amount of toluol has been extracted unless the purchaser is equipped to extract the toluol. The order refers to drip oil from the gas industry and light oil produced at coke plants; it does affect oil from petroleum sources. Benzol likewise comes under an allocation order with its use in motor fuel forbidden. Coke plants and other producers are ordered to operate so as to obtain the maximum of 2 deg. benzol after the largest possible amount of toluol has been extracted.

In order to increase production of aviation gasoline and nitration-grade toluol, deliveries of aromatic petroleum solvents normally used in paints and other protective coatings, is limited to orders bearing high preference ratings. This is designed to divert more than half of the two principal constituents of such solvents—toluol and xylols—from use in the coating field to the more important production of gasoline and toluol.

Distribution of naphthalene also was controlled beginning June 1. After that date deliveries must be in accordance with schedules issued by the Director of Industry Operations. Shipments may be made without authorization solely for the purpose of refining; to persons who will refine the naphthalene but will not consume all the amount delivered in further processing; up to 50 lb. may be shipped to one person in any month provided the receiver does not obtain more than that amount from all sources and that the aggregate of producer deliveries does not exceed 2 percent of his production; of oils containing less than 2.5 percent naphthalene. It further stipulates that no producer shall refine the crude product except on orders for refined specifically authorized nor to refine any naphthalene during any one month unless provision has been made for all deliveries of the grades ordered delivered by the Director of Industry Operations.

Chlorate of potash has been in limited supply from the time imports were suspended and more recently chlorate of soda has been in a sold-up position. From the beginning of this month all chlorate chemicals are under strict control not only with respect to shipments but also with respect to production. The order specifies that no producer or distributor may make shipments except upon specific authorization and furthermore the WPB will decide what chlorates a producer may manufacture and also dictate their final use.

A preference order also affects distribution of all grades of butyl alcohol but the effective date is July 1. Purchasers will apply for allocations on Form PD-505 and producers and distributors will report on Form PD-506. Deliveries to persons using less than 54 gallons a month may be made without allocation provided the total of these deliveries does not exceed 2 percent of a producers monthly output. Producers also are required to use grain to the fullest possible extent and may not use molasses unless their grain facilities are in use to the utmost.

Allocation of capryl alcohol, isopropyl alcohol, and methyl ethyl ketone likewise starts on July 1. Prospective purchasers are required to fill out specified forms which will be made the basis for allocation. The order states that capryl alcohol is used in the manufacture of certain synthetic rubber and coating materials, as an ingredient in lubricating oils and as a fluid in hydraulic brakes. Amyl alcohol is now being substituted in brake fluids. Isopropyl alcohol is used chiefly in the manufacture of acetone but the preference order was issued to provide other users with adequate supplies. Methyl ethyl ketone goes principally into materials which are used for protective coatings. In the case of each of these chemicals, quantities of less than 54 gallons may be delivered under the conditions cited for butyl alcohol.

To insure adequate supplies for war purposes and to distribute as equitably as possible all amounts available for agricultural purposes delivery of by-product ammonia, synthetic ammonia, sulphate of ammonia, and cyanamid by a producer or seller is prohibited except under specific authorization. Manufacturers and retailers of fertilizer are not included in this order.

The war program calls for enlarged use of styrene and in order to conserve

CHEM. & MET. Weight Index of CHEMICAL PRICES

Base=100 for 1937

This month	**109.39**
Last month	109.40
June, 1941	100.49
June, 1940	98.57

Price changes during the month were unimportant as all the more prominent products have been stabilized. New price schedules were issued for potash salts but they were in very close agreement with those previously in effect. Some of the solvents are said to have sold at lower levels but generally they are firm.

supplies, distribution was placed under control. The order was issued on June 1 and became effective at once.

The question of anti-freeze materials has been of interest for some time and the situation has been somewhat clarified by the issuance of a limiting order which stipulates that production will be put on a quota basis. The quotas have not yet been established but it is expected that they will restrict each producer to about 50 per cent of the amount of anti-freeze sold by him last season. This restriction refers only to anti-freeze for civilian use as outputs for government divisions, lend-lease, etc., are in addition to the quotas.

In contrast with the restrictive nature of most orders issued during the month, the dyestuffs conservation order was amended to increase the quantity of dyes available for civilian use. Golden orange G has been removed from the prohibited list of military dyes and the quota basis has been changed so that consumers may use 12½ percent of the amount used last year, including his use of military dyes in reaching this total. The definition of a military dye was changed to mean a mixture containing more than 10 percent of a military dye whereas in the original order not more than 2 percent of a military color was permitted in a mixture for civilian use.

Other developments of market significance during the month included a movement in Congress to remove the import duty of 2c a gallon on coconut oil. Under the Tariff Law only imports from the Philippines were exempt from the duty. With the removal of the duty, coconut oil from other producing countries may be made more readily available.

The soap industry also may find an outlet for some of its surplus stocks by virtue of the placing of soap on the list of materials which come under lend-lease regulations.

OPA has allowed the Charles S. Bush Co., Providence, to set its maximum price for crude wool grease and degras at 111 percent of its sales price on last Nov. 17. On that date the company sold in 100-drum lots at 7¼c a lb. fob shipping point. Hence the maximum price in 100-lb. drum lots is 8.325c.

CHEM. & MET.

Weighted Index of Prices for

OILS & FATS

Base=100 for 1937

This month	**143.60**
Last month	143.93
June, 1941	112.00
June, 1940	73.36

Most of the oils are holding at maximum levels and those that are not under ceilings change but little. A large flax crop is in prospect but so far linseed oil values have been maintained. Prospects for coconut oil are bettered by the movement to remove the import duty but many primary markets are closed.

6 WAYS* TO DO A BIGGER WAR JOB *with* STAINLESS STEEL EQUIPMENT

#3 *design for* LONGER WEAR *and* FASTER CLEANING

All out war production calls for continuous operation with minimum shutdowns for cleaning. That's why *Round Corner Construction* is necessary for processing vessels today. Vessels with Round Corners are stronger. They take less time to clean.

Your fabricator must have specialized experience and equipment to produce round corner stainless steel vessels economically. Blickman engineers have pioneered in this field. They can be of great help to you in designing *UNINTERRUPTED PRODUCTION* into your equipment right from the beginning. Consult with us.

**Third in the series of advertisements written in the interest of efficient war production.*

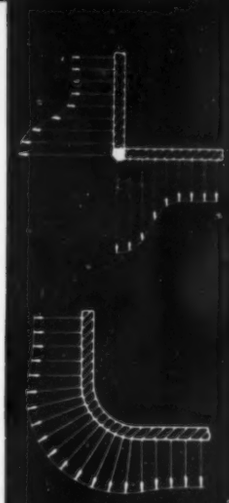
ALL ORDERS SUBJECT TO GOVERNMENT PRIORITY REGULATIONS

"What to Look for When You Specify Stainless Steel for Your Processing Equipment", a valuable guide for engineers, will be sent on request to those who write us on their company stationery

ROUND CORNERS ARE STRONGER

The ordinates represent the approximate character of maximum stresses in the region of a square corner in a vessel under pressure. Note the considerable increase in stress at the corner. This is due to high stress concentration in the sharp angle and to discontinuity stresses originating from the rapid change of direction of the surface.

The ordinates here represent the approximate character of maximum stresses in the region of a round corner of a vessel under pressure. Stress concentration is entirely eliminated, discontinuity stresses are smaller. Hence there is little increase in stress at the corner. Equipment stands up better.



ROUND CORNERS ARE EASY TO CLEAN

Even the best brushes require extra time to clean accumulations gathered in square corners. With gummy material or material that hardens, complete removal may never be possible This is especially important with highly corrosive materials.

In Blickman round corner construction the brush has no difficulty in cleaning the entire surface of the round corner. Cleaning with ordinary brushes is a quick process. Shutdown time for cleaning is appreciably lessened. This saves time and reduces the danger of contamination and corrosion.

S. BLICKMAN, INC.

606 GREGORY AVE., WEEHAWKEN, N. J.

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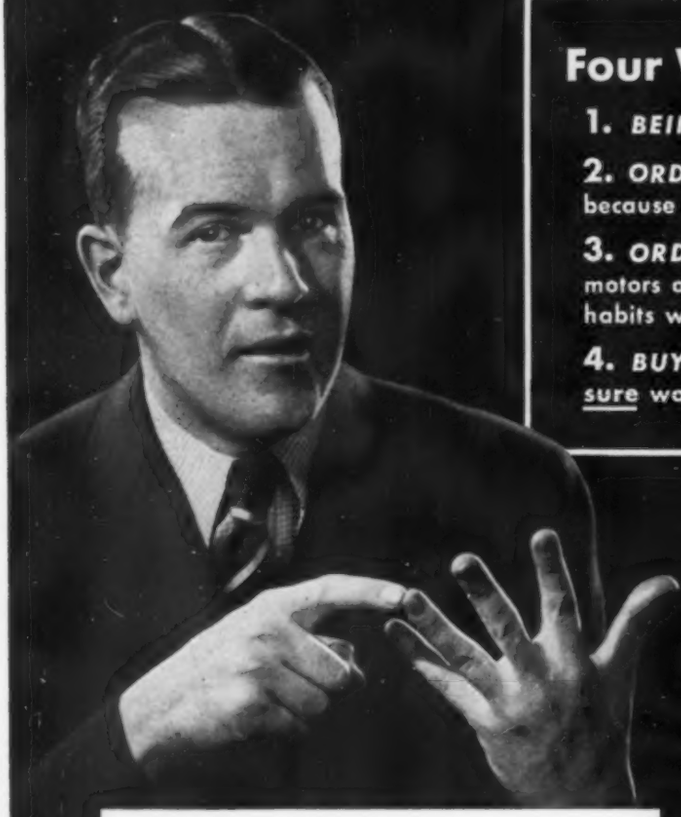


Four Ways To Buy MOTORS!

1. ***BEING SOLD.*** This isn't really "buying."
2. ***ORDERING BY TRADE-MARK.*** Unsound, because all well-known motors are <u>not</u> alike.
3. ***ORDERING BY HABIT.*** Costly, because motors and power needs have changed since old habits were formed.
4. ***BUYING BY COMPARING MOTORS.*** The <u>sure</u> way to get top value.

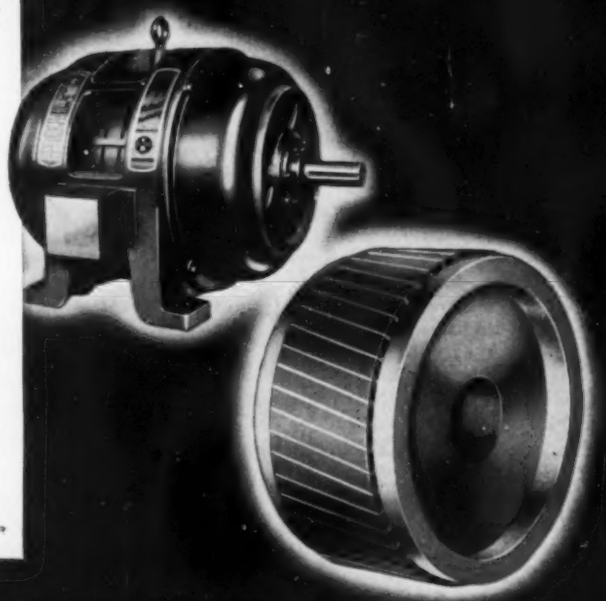
WHICH WAY DO <u>YOU</u> BUY MOTORS?

BECAUSE we believe you know motor quality when you see it, we highly recommend Method 4—*buying by comparing motors.*

Yes, proud as we are of the Fairbanks-Morse trade-mark, we ask you to *look beyond the trade-mark* . . . to ignore sales talks and buying habits . . . and look at the motors, construction point by point.

Compare the exclusive Fairbanks-Morse Copperspun Rotor, for instance, with any other type of rotor. Then ask yourself whether you want windings centrifugally cast of COPPER, or of some less suitable metal.

A post card or telephone call will bring you a demonstration . . . let you look beyond the trade-mark at the rotor and at the many other construction superiorities which make F-M Motors stand up better under today's production tempo. Fairbanks, Morse & Co., Dept. F19, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.



Copperspun

FAIRBANKS·MORSE MOTORS

DIESEL ENGINES ELECTRICAL MACHINERY · MAGNETOS RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS MOTORS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

CHEM & MET CURRENT PRICES

INDUSTRIAL CHEMICALS

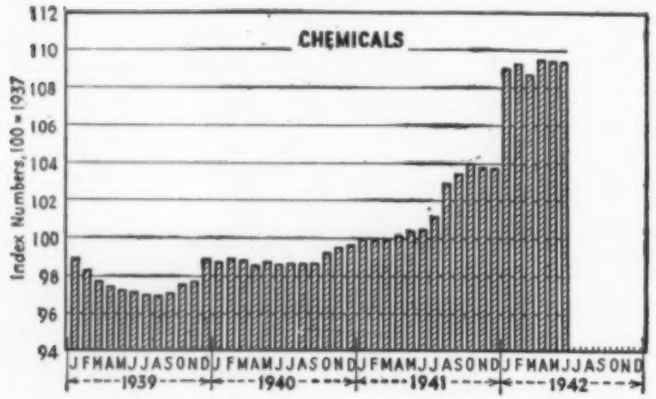
	Current Price	Last Month	Last Year
Acetone, drums, lb	$0.168–$0.173	$0.168– $.173	$0.07½–$0.08
Acid, acetic, 28%, bbl., cwt	3.38 – 3.63	3.38 – 3.63	2.23 – 2.48
Glacial 99.5%, drums	9.15 – 9.40	9.15 – 9.40	8.43 – 8.68
U. S. P. X 1, 99.5%, dr	10.95 –11.20	10.95 –11.20	10.25 –10.50
Boric, bbl., ton	108.00–113.00	108.00–113.00	106.00–111.00
Citric, kegs, lb	.20 – .23	.20 – .23	.20 – .23
Formic, cbys., lb	.10½– .11	.10½– .11	.10½– .11
Gallic, tech., bbl., lb	1.10 – 1.15	1.10 – 1.15	.90 – 1.00
Hydrofluoric 30% drums, lb	.08 – .08½	.08 – .08½	.08 – .08½
Lactic, 44%, tech., light, bbl., lb	.073– .075	.073– .075	.06½– .06¾
Muriatic, 18°, tanks, cwt	1.05 –.....	1.05 –.....	1.05 –.....
Nitric, 36°, carboys, lb	.05 – .05½	.05 – .05½	.05 – .05½
Oleum, tanks, wks., ton	18.50 –20.00	18.50 –.....	18.50 –20.00
Oxalic, crystals, bbl., lb	.11½– .13	.11½– .13	.10½– .12
Phosphoric, tech., c'bys., lb	.07½– .08½	.07½– .08½	.07½– .08½
Sulphuric, 60°, tanks, ton	13.00 –.....	13.00 –.....	13.00 –.....
Sulphuric, 66°, tanks, ton	16.50 –.....	16.50 –.....	16.50 –.....
Tannic, tech., bbl., lb	.71 – .73	.71 – .73	.54 – .56
Tartaric, powd., bbl., lb	.70 –.....	.70 –.....	.63 –.....
Tungstic, bbl., lb	nom.....	nom.....	nom.....
Alcohol, amyl	–.....	–.....	–.....
From Pentane, tanks, lb	.131–.....	.131–.....	.111–.....
Alcohol, Butyl, tanks, lb	.158–.....	.158–.....	.09 –.....
Alcohol, Ethyl, 190 p'f., bbl., gal	8.19 – 8.25	8.19 – 8.25	6.04 –.....
Denatured, 190 proof	–.....	–.....	–.....
No. 1 special, dr., gal. wks	.60 –.....	.60 –.....	.33 –.....
Alum, ammonia, lump, bbl., lb	.03½– .04	.03½– .04	.03½– .04
Potash, lump, bbl., lb	.04 – .04½	.04 – .04½	.03½– .04
Aluminum sulphate, com. bags, cwt	1.15 – 1.40	1.15 – 1.40	1.15 – 1.40
Iron free, bg., cwt	1.85 – 2.10	1.85 – 2.10	1.60 – 1.70
Aqua ammonia, 26°, drums, lb	.02½– .03	.02½– .03	.02½– .03
tanks, lb	.02 – .02¼	.02 – .02¼	.02 – .02¼
Ammonia, anhydrous, cyl., lb	.16 –.....	.16 –.....	.16 –.....
tanks, lb	.04½–.....	.04½–.....	.04½–.....
Ammonium carbonate, powd. tech., casks, lb	.09½– .12	.09½– .12	.09 – .12
Sulphate, wks., cwt	1.45 –.....	1.45 –.....	1.45 –.....
Amylacetate tech., from pentane, tanks, lb	.145–.....	.145–.....	.105–.....
Antimony Oxide, bbl., lb	.15 –.....	.15 –.....	.12 –.....
Arsenic, white, powd., bbl., lb	.04 – .04½	.04 – .04½	.03½– .04
Red, powd., kegs, lb	nom.....	nom.....	nom.....
Barium carbonate, bbl., ton	60.00 –65.00	60.00 –65.00	52.50 –57.50
Chloride, bbl., ton	79.00 –81.00	79.00 –81.00	79.00 –81.00
Nitrate, casks, lb	.11 – .12	.10½– .11	.09½– .10
Blanc fix, dry, bbl., lb	.03½– .04	.03½– .04	.03½– .04
Bleaching powder, f.o.b., wks., drums, cwt	2.25 – 2.35	2.25 – 2.35	2.00 – 2.10
Borax, gran., bags, ton	44.00 –.....	44.00 –.....	43.00 –.....
Bromine, cs., lb	.30 – .32	.30 – .32	.30 – .32
Calcium acetate, bags	3.00 –.....	3.00 –.....	1.90 –.....
Arsenate, dr., lb	.07 – .08	.07 – .08	.06½– .06¾
Carbide drums, lb	.04½– .05	.04½– .05	.04½– .05
Chloride, fused, dr., del., ton	18.00 –24.00	18.00 –24.00	19.00 –24.50
flake, bags., del., ton	18.50 –25.00	18.50 –25.00	18.50 –25.00
Phosphate, bbl., lb	.07½– .08	.07½– .08	.07½– .08
Carbon bisulphide, drums, lb	.05½–.....	.05½–.....	.05 –.....
Tetrachloride drums, gal	.73 – .80	.73 – .80	.66½– .73
Chlorine, liquid, tanks, wks.,100lb	2.00 –.....	2.00 –.....	1.75 –.....
Cylinders	.05½– .06	.05½– .06	.05½– .06
Cobalt oxide, cans, lb	1.84 – 1.87	1.84 – 1.87	1.84 – 1.87
Copperas, bgs., f.o.b., wks., ton	18.00 –19.00	18.00 –19.00	18.00 –19.00
Copper carbonate, bbl., lb	.18 – .20	.18 – .20	.10 – .16
Sulphate, bbl., cwt	5.15 – 5.40	5.15 – 5.40	4.75 – 5.00
Cream of tartar, bbl., lb	.57 –.....	.57 –.....	.52 –.....
Diethylene glycol, dr., lb	.14 – .15½	.14 – .15½	.22 – .23
Epsom salt, dom., tech., bbl., cwt	1.90 – 2.00	1.90 – 2.00	1.80 – 2.00
Ethyl acetate, drums, lb	.12–.....	.12 –.....	.07½–.....
Formaldehyde, 40%, bbl., lb	.05½– .06	.05½– .06½	.05½– .06
Furfural, tanks, lb	.09 –.....	.09 –.....	.09 –.....
Fusel oil, drums, lb	.18 – .19	.18 – .19	.16 – .17
Glaubers salt, bags, cwt	1.05 – 1.10	1.05 – 1.10	.95 – 1.00
Glycerine, c.p., drums, extra, lb	.18½–.....	.18½–.....	.12½–.....
Lead;			
White, basic carbonate, dry casks, lb	.08½–.....	.08½–.....	.07½–.....
White, basic sulphate, sck., lb	.07½–.....	.07½–.....	.07½–.....
Red, dry, sck., lb	.09½– .09¾	.09½–.....	.0835–.....
Lead acetate, white crys., bbl., lb	.12½– .13	.12½– .13	.11 – .12
Lead arsenate, powd., bag, lb	.11 – .12	.11 – .12	.09½– .11
Lime, chem., bulk, ton	8.50 –.....	8.50 –.....	8.50 –.....
Litharge, pwd., csk., lb	.08½–.....	.08½–.....	.0735–.....
Lithopone, bags, lb	.04½– .04¾	.04½– .04¾	.038– .04
Magnesium carb., tech., bags, lb	.06½– .06¾	.06½– .06¾	.06½– .06¾
Methanol, 95%, tanks, gal	.60 –.....	.60 –.....	.29 –.....
97%, tanks, gal	.60 –.....	.60 –.....	.30 –.....
Synthetic, tanks, gal	.28 –.....	.28 –.....	.30 –.....
Nickel salt, double, bbl., lb	.13½– .13¾	.13½– .13¾	.13½–.....
Orange mineral, csk., lb	.12½–.....	.12½–.....	.11½–.....
Phosphorus, red, cases, lb	.40 – .42	.40 – .42	.40 – .42
Yellow, cases, lb	.18 – .25	.18 – .25	.18 – .25
Potassium bichromate, casks, lb	.09½– .10	.09½– .10	.08½– .09
Carbonate, 80–85%, calc. csk., lb	.06½– .07	.06½– .07	.06½– .07
Chlorate, powd., lb	.10 – .12	.10 – .12	.10 – .12
Hydroxide (c'stic potash) dr., lb	.07 – .07¼	.07 – .07¼	.07 – .07¼
Muriate, 60% bags, unit	.53½–.....	.53½–.....	.53½–.....
Nitrate, bbl., lb	.05½– .06	.05½– .06	.05½– .06
Permanganate, drums, lb	.19½– .20	.19½– .20	.19½– .20
Prussiate, yellow, casks, lb	.17 – .18	.17 – .18	.15 – .16
Sal ammoniac, white, casks, lb	.0515– .06	.0515– .06	.0515– .06
Salsoda, bbl., cwt	1.00 – 1.05	1.00 – 1.05	1.00 – 1.05
Salt cake, bulk, ton	17.00 –.....	17.00 –.....	17.00 –.....
Soda ash, light, 58%, bags, contract, cwt	1.05 –.....	1.05 –.....	1.05 –.....
Dense, bags, cwt	1.10 –.....	1.10 –.....	1.10 –.....
Soda, caustic, 76%, solid, drums, cwt	2.30 – 3.00	2.30 – 3.00	2.30 – 3.00
Acetate, del., bbl., lb	.05 – .06	.04½– .06	.04 – .05
Bicarbonate, bbl., cwt	1.70 – 2.00	1.70 – 2.00	1.70 – 2.00
Bichromate, casks, lb	.07½– .08	.07½– .08	.06½– .07
Bisulphate, bulk, ton	16.00 –17.00	16.00 –17.00	16.00 –17.00
Bisulphite, bbl., lb	.03 – .04	.03 – .04	.03 – .04
Chlorate, kegs, lb	.06½– .06½	.06½– .06½	.06½– .06¾
Cyanide, cases, dom., lb	.14 – .15	.14 – .15	.14 – .15
Fluoride, bbl., lb	.08 – .09	.08 – .09	.07 – .08
Hyposulphite, bbl., cwt	2.40 – 2.50	2.40 – 2.50	2.40 – 2.50
Metasilicate, bbl., cwt	2.50 – 2.65	2.50 – 2.65	2.35 – 2.40
Nitrate, bulk, cwt	1.35 –.....	1.35 –.....	1.45 –.....
Nitrite, casks, lb	.06½– .07	.06½– .07	.06½– .07
Phosphate, tribasic, bags, lb	2.70 –.....	2.70 –.....	2.35 –.....
Prussiate, yel. drums, lb	.10½– .11	.10½– .11	.10½– .11
Silicate (40° dr.), wks., cwt	.80 – .85	.80 – .85	.80 – .85
Sulphide, fused, 60–62%, dr. lb	.03 – .03½	.03 – .03½	.02½– .03
Sulphite, crys., bbl., lb	.02½– .02½	.02½– .02½	.02½– .02½
Sulphur, crude at mine, bulk, ton	16.00 –.....	16.00 –.....	16.00 –.....
Chloride, dr., lb	.03 – .04	.03 – .04	.03 – .04
Dioxide, cyl., lb	.07 – .08	.07 – .08	.07 – .07½
Flour, bag, cwt	1.90 – 2.40	1.90 – 2.40	1.60 – 3.00
Tin Oxide, bbl., lb	.55 –.....	.55 –.....	.54 –.....
Crystals, bbl., lb	.39½–.....	.39½–.....	.39 –.....
Zinc, chloride, gran., bbl., lb	.05½– .06	.05 – .06	.05 – .06
Carbonate, bbl., lb	.14 – .15	.14 – .15	.14 – .15
Cyanide, dr., lb	.33 – .35	.33 – .35	.33 – .35
Dust, bbl., lb	.10½–.....	.09½–.....	.09½–.....
Zinc oxide, lead free, bag, lb	.07½–.....	.07½–.....	.06½–.....
5% leaded, bags, lb	.07½–.....	.07½–.....	.06½–.....
Sulphate, bbl., cwt	3.85 – 4.00	3.85 – 4.00	3.15 – 3.25

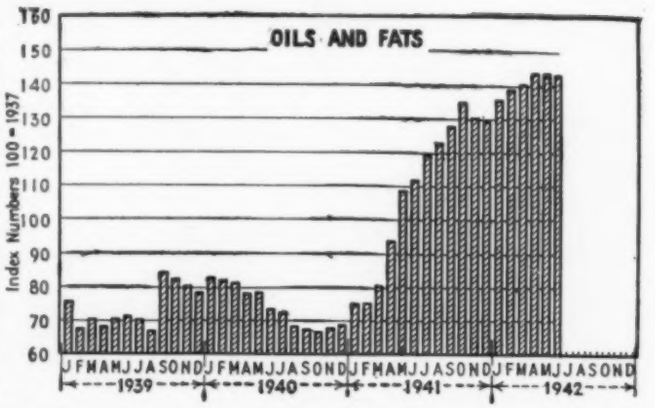
The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected June 12

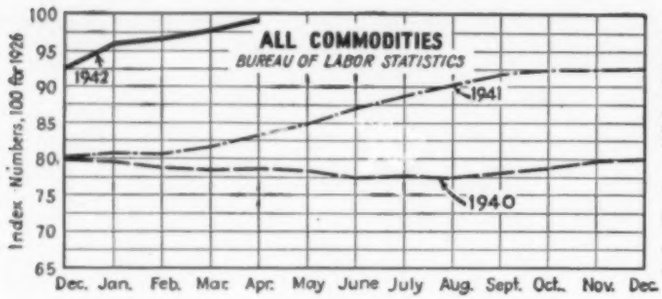
OILS AND FATS

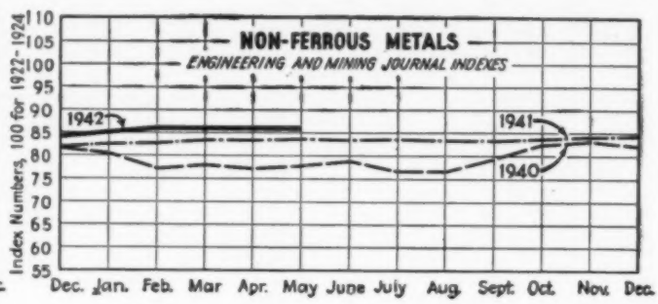
	Current Price	Last Month	Last Year
Castor oil, 3 bbl., lb	$0.13½–$0.14½	$0.13½–$0.14½	$0.11 –$0.11½
Chinawood oil, bbl., lb	.38 –.....	.38 –.....	.32 –.....
Coconut oil, Ceylon, tank, N. Y., lb	nom	nom	.07 –.....
Corn oil crude, tanks (f.o.b. mill), lb	.12½–.....	.12½–.....	.10½–.....
Cottonseed oil, crude (f.o.b. mill), tanks, lb	.12½–.....	.12½–.....	.09½–.....
Linseed oil, raw car lots, bbl., lb	.139–.....	.141–.....	.107–.....
Palm, casks, lb	.09 –.....	.09 –.....	.05½–.....
Peanut oil, crude, tanks (mill), lb	.13 –.....	.13 –.....	.09½–.....
Rapeseed oil, refined, bbl., lb	nom	nom	.12 –.....
Soya bean, tank, lb	.11½–.....	.11½–.....	.09½–.....
Sulphur (olive foots), bbl., lb	.19½–.....	.19 –.....	.14½–.....
Cod, Newfoundland, bbl., gal	nom	nom	nom .....
Menhaden, light pressed, bbl., lb	.114–.....	.114–.....	.10 –.....
Crude, tanks (f.o.b. factory) gal	.66 –.....	.66 –.....	.50 –.....
Grease, yellow, loose, lb	.09295–.....	.09295–.....	.07½–.....
Oleo stearine, lb	.09½–.....	.09½–.....	.09½–.....
Oleo oil, No. 1	.11½–.....	.11½–.....	.10½–.....
Red oil, distilled, dp.p. bbl., lb	.12 –.....	.12 –.....	.10½–.....
Tallow extra, loose, lb	.097125–...	.097125–...	.07½–.....

Chem. & Met.'s Weighted Price Indexes








NON-FERROUS METALS
ENGINEERING AND MINING JOURNAL INDEXES
Index Numbers, 100 for 1922-1924
1942
1941
1940
Dec. Jan. Feb. Mar Apr. May June July Aug. Sept. Oct. Nov. Dec.

Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-napthol, crude bbl., lb.	$0.52 –$0.55	$0.52 –$0.55	$0.52 –$0.55
Alpha-naphthylamine, bbl., lb.	.32 – .34	.32 – .34	.32 – .34
Aniline oil, drums, extra, lb.	.15 – .16	.15 – .16	.15 – .16
Aniline, salts, bbl., lb.	.22 – .24	.22 – .24	.22 – .24
Benzaldehyde, U.S.P., dr., lb.	.85 – .95	.85 – .95	.85 – .95
Benzidine base, bbl., lb.	.70 – .75	.70 – .75	.70 – .75
Benzoic acid, U.S.P., kgs., lb.	.54 – .56	.54 – .56	.54 – .56
Benzyl chloride, tech., dr., lb.	.23 – .25	.23 – .25	.23 – .25
Benzol, 90%, tanks, works, gal.	.15 –.....	.15 –.....	.14 –.....
Beta-naphthol, tech., drums, lb.	.23 – .24	.23 – .24	.23 – .24
Cresol, U.S.P., dr., lb.	.11 –.....	.11 – .11	.09½– .10
Cresylic acid, dr., wks., gal.	.81 – .83	.81 – .83	.58 – .60
Diethylaniline, dr., lb.	.40 – .45	.40 – .45	.40 – .45
Dinitrophenol, bbl., lb.	.23 – .25	.23 – .25	.23 – .25
Dinitrotoluol, bbl., lb.	.18 – .19	.18 – .19	.15½– .16
Dip oil, 15%, dr., gal.	.23 – .25	.23 – .25	.23 – .25
Diphenylamine, dr. f.o.b. wks., lb.	.60 –.....	.60 –.....	.....
H-acid, bbl., lb.	.45 – .50	.45 – .55	.45 – .50
Naphthalene, flake, bbl., lb.	.07 – .07½	.07 – .07½	.07 – .07½
Nitrobenzene, dr., lb.	.08 – .09	.08 – .09	.08 – .09
Para-nitraniline, bbl., lb.	.47 – .49	.47 – .49	.47 – .49
Phenol, U.S.P., drums, lb.	.13 –.....	.13 –.....	.12 –.....
Picric acid, bbl., lb.	.35 – .40	.35 – .40	.35 – .40
Pyridine, dr., gal.	1.70 – 1.80	1.70 – 1.80	1.70 – 1.80
Resorcinol, tech., kegs, lb.	.75 – .80	.75 – .80	.75 – .80
Salicylic acid, tech., bbl., lb.	.33 – .40	.33 – .40	.33 – .40
Solvent naptha, w.w., tanks, gal.	.27 –.....	.27 –.....	.27 –.....
Toluidine, bbl., lb.	.86 – .88	.86 – .88	.86 – .88
Toluol, drums, works, gal.	.33 –.....	.33 –.....	.30 –.....
Xylol, com, tanks, gal.	.26 –.....	.26 –.....	.26 –.....

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton.	$22.00–$25.00	$22.00–$25.00	$22.00–$25.00
Casein, tech, bbl., lb.	.17 – .20	.20 – .25	.21 – .22
China clay, dom., f.o.b. mine, ton.	8.00 –20.00	8.00 –20.00	8.00 –20.00
Dry colors			
Carbon gas, black (wks.), lb.	.0335– .30	.0335– .30	.028– .30
Prussian blue, bbl., lb.	.36 – .37	.36 – .37	.36 – .37
Ultramarine blue, bbl., lb.	.11 – .26	.11 – .26	.10 – .26
Chrome green, bbl., lb.	.21½– .30	.21½– .30	.21 – .27
Carmine, red, tins, lb.	4.60 – 4.75	4.60 – 4.75	4.85 – 5.00
Para toner, lb.	.75 – .80	.75 – .80	.75 – .80
Vermilion, English, bbl., lb.	3.05 – 3.10	3.05 – 3.10	3.12 – 3.20
Chrome yellow, C.P., bbl., lb.	.14½– .15½	.14½– .15½	.14½– .15½
Feldspar, No. 1 (f.o.b.N.C.), ton.	6.50 – 7.50	6.50 – 7.50	6.50 – 7.50
Graphite, Ceylon, lump, bbl., lb.	.08 – .10	.08 – .10	.06 – .06½
Gum copal Congo, bags, lb.	.09 – .30	.09 – .30	.06 – .30
Manila, bags, lb.	.09 – .15	.09 – .14	.09 – .14
Damar, Batavia, cases, lb.	.10 – .22	.10 – .20	.08 – .24
Kauri, cases, lb.	.18 – .60	.18 – .60	.18½– .60
Kieselguhr (f.o.b. mines), ton.	7.00 –40.00	7.00 –40.00	7.00 –40.00
Magnesite, calc, ton	64.00 –.....	65.00 –.....	65.00 –.....
Pumice stone, lump, bbl., lb.	.05 – .07	.05 – .08	.05 – .07
Imported, casks, lb.	nom	nom	.03 – .04
Rosin, H., 100 lb.	3.33 –.....	3.39 –.....	2.48 –.....
Turpentine, gal.	.67 –.....	.67 –.....	.47½–.....
Shellac, orange, fine, bags, lb.	.43 –.....	.43 –.....	.34 –.....
Bleached, bonedry, bags, lb.	.40 –.....	.40 –.....	.31½–.....
T. N. Bags, lb.	.32 –.....	.32 –.....	.24 –.....
Soapstone (f.o.b. Vt.), bags, ton.	10.00 –12.00	10.00 –12.00	10.00 –12.00
Talc, 200 mesh (f.o.b. Vt.), ton.	8.00 – 8.50	8.00 – 8.50	8.00 – 8.50
200 mesh (f.o.b. Ga.), ton.	6.00 – 8.00	6.00 – 8.00	7.50 –11.00

Industrial Notes

ALLIS-CHALMERS MFG. CO., Milwaukee, has appointed William C. Johnson manager of its general sales organization. Formerly he was sales manager of the crushing and cement division.

JAS. P. MARSH CORP., Chicago, has advanced A. D. Rose to the position of assistant general manager. He is succeeded as sales manager by James Emmett, Jr.

UNION BAY STATE CO., Cambridge, Mass., has appointed George C. Sheldon general sales manager.

RAYBESTOS-MANHATTAN, INC., New York, has added to its board of directors, J. H. Matthews, assistant general manager of the Manhattan Rubber Mfg. Division of Passaic, N. J., and O. H. Cilley, assistant general manager of the United States Asbestos Division, Manheim, Pa.

DELTA-STAR ELECTRIC CO., Chicago, has selected Robert S. Keeler to manage its office in New York.

MANNING, MAXWELL & MOORE, Bridgeport, Conn., has transferred Fred Crabbe from the Corpus Christi territory to Dallas, Texas. Mr. Crabbe succeeds Alfred Kent who is on active duty with the Navy.

ALLEGHENY LUDLUM STEEL CORP., Pittsburgh, has advanced W. R. Kuhn, assistant manager in its Cleveland office, to the position of district manager.

ENCO CHEMICAL CORP., 441 Lexington Ave., New York, is now the corporate name for the business which for years was carried on by the Neuberg Chemical Corp. Officers and personnel remain unchanged.

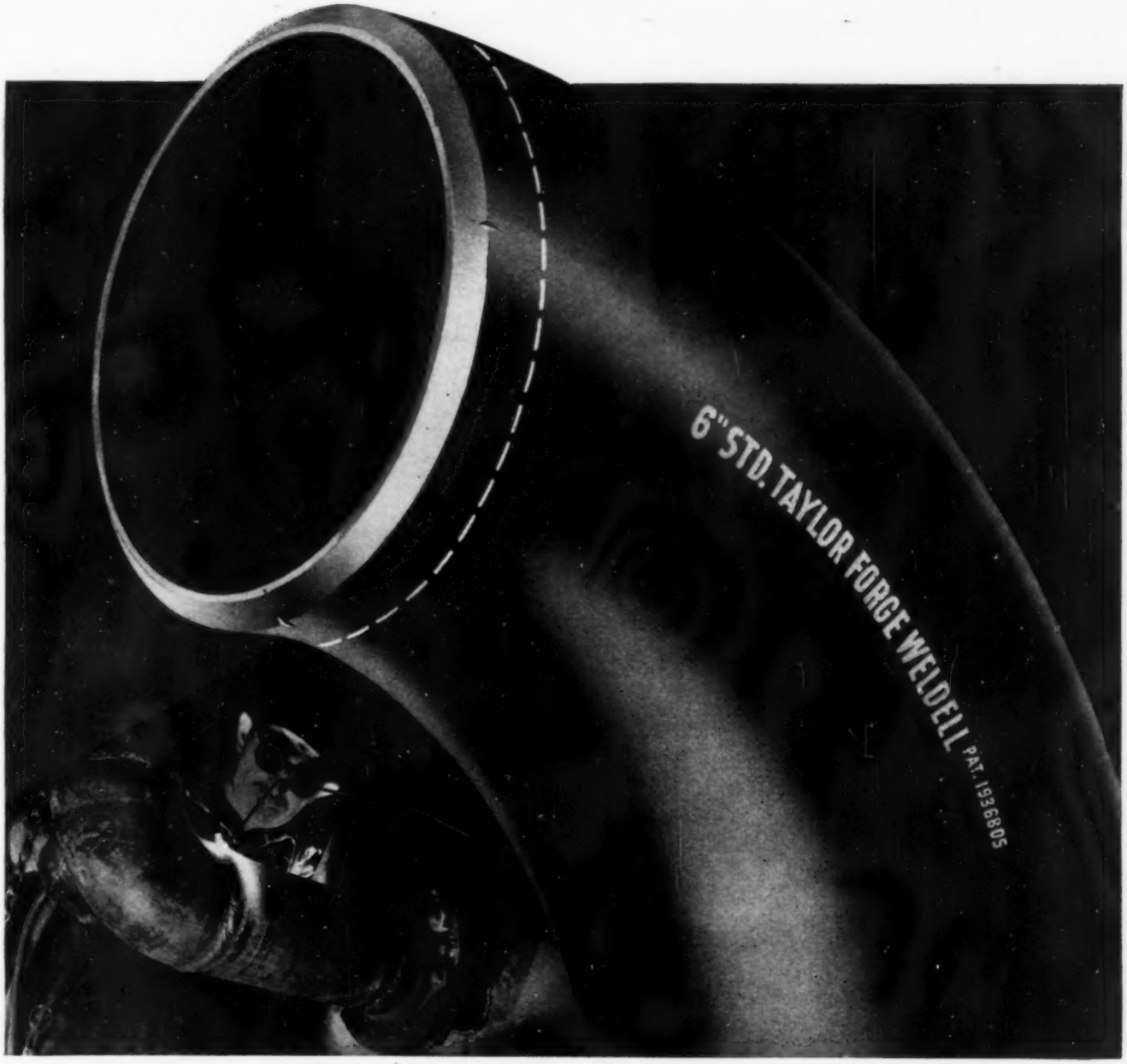
GELATIN PRODUCTS CO., New York, has appointed J. R. Brenemen as its representative on the Pacific Coast. Mr. Brenemen will have his headquarters in Los Angeles.

THE B. F. GOODRICH CO., Akron, has appointed George Livermore district manager at St. Louis to take the place of John S. Gulledge who has entered the Army Air Corps.

UNITED STATES TESTING COMPANY, INC., Hoboken, N. J., has sent A. O. Silva to Brazil where he will take charge of the company's activities in South America. He will have his headquarters in Sao Paulo, Brazil.

JONES-DABNEY CO., Louisville, has moved its aviation research laboratory together with sales and service units from Malden, Mass. to the home plant.

METAL & THERMIT CORP., New York, has appointed Harold P. Blum as its Cleveland territory representative to handle sales and service of the Murex line of arc welding electrodes.



TANGENTS rank high in the list of extra values

THOSE straight segments on each end of every WeldELL accomplish three important things: They make lining up easier; keep the weld out of the zone of greatest stress; facilitate the use of slip-on flanges.

This feature, which of course entails extra manufacturing operations, is just one of many examples of the extra-value you get in WeldELLS and other Taylor Forge Fittings for pipe welding.

A number of other extra-value features are listed opposite. Notice that each contributes something to the ease and economy of installation or to the soundness of the finished job.

These features are combined only in WeldELLS. Lacking any one of them WeldELLS could not be *"the fittings that have everything"*.

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P.O. Box 485
New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.

WeldELLS
have *everything*—

No other fittings for pipe welding combine these eight features. In addition to tangents these features are:

1. **Seamless**—Greater strength and uniformity.
2. **Precision quarter-marked ends** — simplify layout and help insure accuracy.
3. **Selective reinforcement** — provides uniform strength.
4. **Permanent and complete identification marking**—saves time and eliminates errors in shop and field.
5. **Wall thickness never less than specification minimum**—assures full strength and long life.
6. **Machine tool beveled ends**—provide best welding surface and accurate bevel and land.
7. **The most complete line of Welding Fittings and Forged Steel Flanges in the World**—insures complete service and undivided responsibility.

CHEM & MET NEW CONSTRUCTION

	Current Projects: Proposed Work	Current Projects: Contracts	Cumulative 1942: Proposed Work	Cumulative 1942: Contracts
New England	.....	.....	$2,550,000	$4,050,000
Middle Atlantic	$540,000	$1,460,000	6,721,000	54,798,000
South	40,000	.....	9,345,000	42,583,000
Middle West	2,540,000	126,100,000	82,415,000	56,445,000
West of Mississippi	18,070,000	31,640,000	170,437,000	172,480,000
Far West	15,375,000	400,000	20,350,000	109,482,000
Canada	4,238,000	357,000	9,590,000	357,000
	$40,803,000	$159,957,000	$301,408,000	$440,195,000

PROPOSED WORK

California—Shell Chemical Co., 100 Bush St., San Francisco, contemplates the construction of a plant. Estimated cost $15,000,000.

Calif., Oakland—Par Soap Co., 767 85th Ave., Oakland, plans to rebuild soap plant recently destroyed by fire with a loss of $300,000.

Ill., Cicero—American Phenolic Corp., 1830 South 54h Ave., Cicero, is having plans prepared by Burnham & Hammond, Archts., 100 North La Salle St., Chicago, for the construction of a 2 story, 80x310 ft. factory.

N. J., Morristown—Allied Chemical & Dye Corp., 61 Broadway, New York, N. Y., plans to construct a laboratory. Estimated cost will exceed $40,000.

Ohio—Electro Metallurgical Co., 30 East 42nd St., New York, N. Y., plans to construct a plant. Estimated cost $2,500,000.

Pa., Washington—Tygart Valley Glass Co., O. C. Noble, Pres., Wylie Ave., is having plans prepared by Frasier Simplex, Inc., Engr., 436 East Beau St., Washington, for the construction of a plant. Estimated cost $500,000.

Tenn., Centreville—International Minerals & Chemical Corp., c/o International Agricultural Co., 20 North Wacker Dr., Chicago, Ill., plans to construct plants here.

Texas—Cities Service Oil Co., Mellie Esperson Bldg., Houston, plans to construct a plant. Estimated cost $18,000,000.

Tex., Brady—Mineral Products Co., c/o B. Brown, Georgetown, plans to expand its facilities. Estimated cost $70,000.

Wash., Lynden—Lynden Refining Co., Lynden, plans to construct a refinery. Estimated cost $75,000.

Alberta—McColl-Frontenac Co., Ltd., Notre Dame St. E., Montreal, Que., in association with Texas Oil Corp. of U.S.A. plans to construct a refinery, etc. Estimated cost $250,000.

Alberta—Standard Oil Co. of British Columbia, 335 Burrard St., Vancouver, B. C., plans to construct a refinery and pipe line.

Alta., Calgary—Imperial Oil, Ltd., Sarnia, Ont., plans to construct an addition to its oil refinery. Estimated cost $50,000.

Alta., Fort Norman—Owner is association with Department of Munitions & Supplies, plans to construct a refinery. Estimated cost $150,000.

Ont., Hamilton—United Gas & Fuel Co. of Hamilton, Ltd., L. T. Pickard, Gen. Mgr., plans to construct a coke oven assembly at its Depew St. plant. Estimated cost $2,000,000.

Ont., Merritton—Alliance Paper Mills, Ltd., Merritton, plans to construct an addition to its sulphide plant. Estimated cost $300,000.

Ont., Oakville—Birmingham Rubber Co., Ltd., Oakville, plans to construct a plant here. Estimated cost $40,000.

Ont., Petrolia—Canadian Oil Co., Petrolia, plans to construct an addition to its refinery and install equipment. Estimated cost $40,000.

Ont., Toronto—British American Oil Co., Ltd., Royal Bank Bldg., plans to construct a plant. Estimated cost $150,000.

Ont., Toronto—Clommel Petroleums Ontario, Ltd., c/o D. B. Walkinshaw, 372 Bay St., plans to construct a refinery. Estimated cost $50,000.

Ont., Toronto—Freedom Chemical Co. of Canada, Ltd., c/o S. L. Bennett, 984 West Eglinton St., plans to construct a plant. Estimated cost $40,000.

Ont., Windsor—Standard Paint & Varnish Co., 845 Wyandotte St., W., plans to construct a 1 story addition to its factory. Estimated cost $40,000.

Que., Asbestos—Canadian Johns-Manville Co., Ltd., Sun Life Bldg., Montreal, plans to construct a plant. Estimated cost $50,000.

Que., Coleraine—Mutual Chemical Co., Ltd., Coleraine, plans to construct a plant. Estimated cost $200,000.

Que., Montreal—Canada Paper Co., Ltd., 407 McGill St., plans to construct an addition to its plant. Estimated cost $188,000.

Que., Montreal—Charles E. Frosst Co., Ltd., St. Paul St., plans to construct an addition to its pharmaceutical products plant. Estimated cost $50,000.

Que., Montreal—Commercial Alcohols, Ltd., St. James St., plans to construct a 70x100 ft. addition to its plant. Estimated cost $150,000.

Sask., Kamsack—Kamsack Gas & Oil Co., Ltd., Kamsack, plans to construct a natural gas plant. H. R. Davis, Liberty Bank Bldg., Buffalo, N. Y., Consult. Gas Engr. Estimated cost $50,000.

CONTRACTS AWARDED

Calif., Trona—West End Chemical Co., Latham Sq. Bldg., Oakland, will construct additions to its plant using its own forces. Estimated cost $300,000.

D. C., Wash.—U. S. Government has awarded the contract for the construction of an oxygen products plant to General Construction Co., 3840 Iowa St., Seattle. Estimated cost $60,000.

Illinois—Texas Oil Co., McLeansboro, has awarded the contract for the construction of a refinery to Fluor Construction Co., Oshkosh, Wis. Estimated cost $1,000,000.

Indiana—U. S. Government, Wash., D. C., has awarded the contract for three plants to be operated by a syndicate of the Standard Oil Co., Sinclair Refining Co. and Cities Service Oil Co. of New York to Stone & Webster Co., 90 Broad St., New York, N. Y. Estimated cost will exceed $100,000,000.

Michigan—Headquarters of the Dow Chemical Co., Midland, has awarded the contract for the construction of a plant to Stone & Webster and Blodget, Inc., 49 Federal St., Boston, Mass. Estimated cost $16,000,000.

Mo., St. Louis—Air Reduction Sales Co., 630 South Second St., has awarded the contract for a 1 story, 56x90 ft. addition to its plant to Murch-Jarvis Co. Cotton Belt Bldg., St. Louis. Estimated cost including equipment $40,000.

N. J., Hillside—Glidden Co., 1936 Union Commerce Bldg., Cleveland, O., has awarded the contract for a 1 story, 100x150 ft. plant to David O. Evans, 1445 North Broad St. Estimated cost including equipment $300,000.

O., Akron—Headquarters of U. S. Rubber Co., Akron, has awarded the contract for the construction of a plant to Sanderson & Porter, 52 William St., New York, N. Y. Estimated cost $10,000,000.

Oklahoma—Phillips Petroleum Co., Bartlesville, will construct two plants using its own forces. Estimated cost $7,000,000 and $8,000,000 respectively.

Pennsylvania—Vanadium Corp. of America, subsidiary of Southern Mineral Products Corp., Bridgeville, has awarded the contract for the construction of a plant to Rust Engineering Co., Clark Bldg., Pittsburgh. Estimated cost $1,000,000.

Pa., Latrobe—Stupakoff Ceramic & Mfg. Co., Latrobe, has awarded the contract for a 1 story, 105x261 ft. plant to Westmoreland Construction Co., 622 West Pittsburgh St., Greensburg. Estimated cost between $50,000 and $100,000.

Texas—Goodyear Tire & Rubber Co., 1144 East Market St., Akron, O., will construct a plant using its own forces. Estimated cost $9,500,000.

Texas—Republic Oil & Refining Corp., Texas City, will construct and operate plant. Estimated cost $6,500,000.

Tex., Texas City—Monsanto Chemical Co., 1700 South Second St., St. Louis, Mo., and Southwest Sugar & Molasses Co., Corpus Christi, plans to remodel 8 story sugar refinery plant by force account. Estimated cost $600,000.

Wash., Vancouver—Air Reduction Sales Co., Inc., 60 East 42nd St., New York, N. Y., has awarded the contract for the construction of a 116x142 ft. oxygen plant to Wegman & Son, Bd. of Trade Bldg., Portland, Ore. Estimated cost $100,000.

Ont., Niagara Falls—Canadian Carborundum Co., Ltd., Stanley St., Niagara Falls, has awarded the contract for a 2 story, 50x130 ft. resinol building and a 1 story, 64x160 ft. process building to Robertson Construction Co., Ltd., Imperial Bank Bldg., Niagara Falls. Estimated cost between $175,000 and $200,000.

Ont., Omemee—North American Leather Co., Ltd., King St., plans to reconstruct its tannery recently destroyed by fire. Work will be done with own forces. Estimated cost $53,000.

Ont., St. Catharines—McKinnon Industries, Ltd., 7 Ontario St., has awarded the contract for a 1 story, 50x200 ft. factory addition to Newman Bros., St. Paul St. Estimated cost $50,000.

Ont., Toronto—Dominion Tar & Chemical Co., Ltd., Morse St., has awarded the contract for three plant buildings to Redfern Construction Co., Ltd., 36 Toronto St., Toronto, at $53,950.

What Can I Do?

EVER SINCE that Sunday morning when havoc swooped from the skies upon Honolulu, a new question has been churning about in millions of American minds. It is this: What can I do to help my country win this war?

This insistent question has pushed aside all matters of personal interest. From now on, individual wants and wishes must give way to the paramount needs of the nation. We all accept that. We have undertaken a huge job. Or, I should say, we have had a huge job thrust upon us. And unless we see that job through successfully it won't much matter what any of us may want.

That job is to win this war.

No longer are we trying to prepare for a war that we may get into. Today we are trying to win a war we're already in—and in up to our eyes. Nothing that any one of us now can do to help himself can get him very much if it does not also help our country to win this war.

I am sure that those who read these words will find many things to do. Some will enlist in the armed services. Some will become active in civilian defense. Some will labor to relieve distress in their home towns. Some will work with organizations set up to serve the men at the front. Each can and will find something he can do.

But this insistent question "What can I do?" goes beyond the individual and his personal service. It re-echoes through the offices and the shops of every American business concern. And what I have to say here is not directed toward individual effort. Rather is it intended for the men and women of American industry who make that industry a living part of American life. Today they are asking themselves: What can industry do? Or better still, what *must* industry do if our country is to finish the job it has started?

Those of us who work in and with American industry have one supreme obligation. We may feel very patriotic; we may be willing to serve "in any capacity;" we may be willing to sacrifice . . . if necessary. But if we fail to meet that one obligation, we shall fail our country in its time of need.

THAT SUPREME OBLIGATION IS AN HONEST DAY'S WORK, EVERY DAY, FROM EVERY MAN, EVERY WOMAN, EVERY MACHINE. . . .

IT IS AS SIMPLE AS THAT!

And that goes for all of us, whether we are engaged in civilian production or working directly on the weapons of war. American victory can be won only through the productivity of American industry.

Efficiency in production is not the responsibility of a few. It can be achieved only as we all put to useful purpose every minute of our time, every ounce of our energy, and every pound of our materials.

This responsibility of industry is the more vital because of what has happened to the business of making war. There was a time when success in war was chiefly a matter of well-trained, well-disciplined armies and competent leaders—when men were everything. In those days, military strength was a matter of strong battalions and able generals. Both still are vital. But today military might is essentially mechanical might. Modern war is an industry just as much as a factory or a railroad. In the first World War, mechanical equipment was relatively simple and limited. But today the special equipment of war and the expert skill needed to use it spell the difference between victory and defeat.

We Americans are not expert war-makers. That is why we must expect to suffer grievous losses before we can win substantial gains. We do not have military training and experience ready to hand when we need them. Neither do we have, ready for action, enough of the machines that are so essential to modern warfare.

So, when it becomes necessary to fight for our lives, we must start from scratch. And today, after a year's effort, we still are not ready to trade blow for blow with enemies who for years have schooled their leaders, trained and disciplined their people, and organized their industries to make war. We shall need more time to develop our strength. And while we are doing that, we must expect reverses.

But there is a brighter side to all this. For it follows that if we are granted this all-important time, the change in the method of warfare is right down our alley. The greater importance of mechanized equipment plays straight into the hand of the world's greatest industrial nation . . . if there is one thing America *does* know, it is industrial production! Our industries know how to produce. They have the skilled manpower. They have the organized facilities. Beyond any doubt, we can produce all that we need to win the victory that we *must* win—if only we are given the time.

THE FIRST RESPONSIBILITY OF THE ARMED FORCES IS TO GAIN THAT TIME FOR US.

THE FIRST RESPONSIBILITY OF INDUSTRY IS TO USE TO THE FULL EVERY SECOND OF THAT TIME IN PRODUCING THE WEAPONS

THE ARMED FORCES NEED TO WIN THE ULTIMATE VICTORY. INDUSTRIAL PRODUCTION IS THE KEY TO VICTORY. BUT IT MUST BE BIGGER PRODUCTION AND FASTER PRODUCTION THAN WE EVER HAVE KNOWN.

Heretofore American industry has worked to produce more of those things which make our lives more enjoyable. Today it must divert much of its energy from the products of peace to the weapons of war.

This change sets up a new yardstick of industrial performance. In time of peace we measure production efficiency in terms of money saved. From now on, we must measure efficiency chiefly in terms of time saved. For the plane, the tank, the gun, or the ship that is ready when it is needed to win a victory, is worth a million times more than the one that is delivered too late to avert a defeat.

Everyone knows how short we are of some materials and machines. But our most tragic shortage is the shortage of time. So whatever we may waste in the days ahead—and unhappily we are bound to waste plenty—let us never forget that the most deadly waste of all is the waste of time.

Time wasted never can be replaced. No one ever has discovered a substitute for time. If we would avoid the waste of this irreplaceable ingredient of victory, we must use every minute of it effectively—*while we still have it.*

That goes for us all. It goes for the man or the woman at the bench, at the desk, at the counter, in the field, or in the executive office. It goes for the politician as well as for the business man. It goes for the humblest and the most powerful. A nation at war cannot carry deadheads. It cannot spare a square foot for any one who will not pull his weight.

In this war, nothing short of complete victory can save the liberties of us all, rich and poor, employer and employee, haves and have-nots alike. The price of that victory is the labor, the loyalty, and the devotion of every last one of us. Winston Churchill said it well for the British people. You know how he said it. I need not repeat it.

All this imposes upon American industry, its owners, its managers, and its workers, the gravest responsibility they ever have assumed. If our country is to survive as a free nation, American industry must rise to that responsibility. If our country should fall, it would fall because American industry fell short of the need. It would be another case of "too little and too late".

This grave responsibility calls for the keenest management industry ever has known. It calls for unremitting research to make the most of our resources. It calls for the reduction of waste to a record minimum: that goes for waste of time, labor, and material. It calls for keeping our machinery working as near to full capacity as we can contrive. It calls for the highest rates of unit production we ever have known. That will mean skillful coordination by management and the most intelligent cooperation that the men in the shops can give. It calls for inventive ingenuity to match that of a nation which has produced some of the world's outstanding technical genius. For this is a war of technical proficiency.

But above all, it calls for a new devotion to the day's work. For so long as we are at war, the day's work will determine our country's security.

Whatever may be our material resources and our technical skill, however resourceful our management, however broad the scale of our effort, industry cannot measure up to its prodigious responsibility if any of us shirk the day's work. Right there is where we find the one thing we *all* can do—the one thing that is within the power of each of us.

THAT ONE THING IS SIMPLY TO DELIVER AN HONEST DAY'S WORK WHEREVER WE ARE CALLED TO SERVE. HONEST WORK WILL WIN THIS WAR. LOAFING WILL LOSE IT. THE SHOWDOWN WILL BE WHETHER HITLER CAN DRIVE HIS PEOPLE TO WORK HARDER THAN WE ARE WILLING TO WORK. THERE IS NO ONE TO DRIVE US. WE MUST DRIVE OURSELVES!

Is that so much to ask? It is all our country asks of us, the men of industry. It is all that the men who must work the guns and tanks in the field ask of us. It is all that the men who work our ships and our planes ask of us. "Give us the planes, the guns, the ships, the tanks, and all the rest of our tools," they tell us, "and we'll give you the victory that means so much to us all. But, in the name of that victory, give them to us quickly—QUICKLY—QUICKLY!"

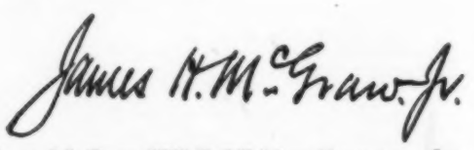
Is that, I repeat, too much to ask of us?

* * * *

To help American industry achieve ever-higher standards of efficiency has been the traditional mission of McGraw-Hill for three-quarters of a century. Normally that effort has been directed toward higher efficiency in the business of peace. But, as in the first World War, twenty-five years ago, it now is directed toward efficiency in the business of war and in every department of American effort that can contribute, directly or indirectly, to the achievement of victory.

And to that mission, I here pledge every resource of this company, its publications, its books, its staff, and every service it is qualified by experience and training to render to American industry, now enlisted in our common cause.

That is what we of McGraw-Hill can do. And that is what we *shall* do to our utmost.



President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

"Ten Silver Months . . ."

"EVERY WEAPON *we make today is worth ten that we might produce next year; for this year – 1942 – is the critical year in the existence of the United States.*"

This grim challenge was thrown at American industry by Donald Nelson in his first speech as chief of the War Production Board. He was speaking to a group of business paper editors, called together to receive at first hand Mr. Nelson's urgent message to the industries they serve.

"We've wasted the golden months", he declared, "the months in which we could have expanded our steel industry, our chemical industry, our copper industry, and all the others, so that we would have plenty of everything. But we still have ten silver months – the months that remain in 1942–and in them we can do things that we never thought possible."

To that objective Mr. Nelson has dedicated his high talents and boundless energy. And to that task he asks American industry to apply the full measure of its resources and skill.

That challenge should be all that it takes to exact from industry the last ounce of its energies. For by now we all can see that in this war the American way of life is at stake. American industry is the essence of the American way of life. Neither can survive without the other. So, even if it had no better reason, industry must go all out to win this war as a measure of self-preservation. Here self-interest and patriotic duty are synonymous. American industry cannot afford to let America lose this war.

The 1942 job is crucial. If it is well done we have a chance to win. If it is badly done we cannot possibly win. There is the measure of the responsibility that now rests upon the shoulders of industrial management.

It is not just Donald Nelson who asks this of industry. He speaks for the millions of fighting men – on land, at sea, in the air – the world over, whose eyes turn so desperately to the workshops of America. There and there alone can they see the hope of victory.

The people of America are not going to let those men down. They demand of industry every effort and every sacrifice that may be necessary to back them up. On that score, American industry stands, of necessity, on trial before our people. It must come through – or else!

* * *

As industry goes all out to meet this demand, its management asks of those who set its tasks and supervise its performance the utmost possible cooperation. It asks of them specifically an understanding of its problems and a chance to work them out without unnecessary interference. It asks for protection against attack from the rear while it concentrates its energies against the common foe. It asks a truce on economic reforms and social experiments that have nothing to do with winning the war and that are bound to arouse misgiving and mistrust amongst the proprietors of industry. Above all, it asks that it be not made a political scapegoat for every deficiency that is sure to develop in the confusion of a war effort.

This does not mean that industry resents honest criticism or constructive direction. Neither does it mean that it is unwilling to do its best unless it can have its own way in all things. The managers of industry are practical men. They know better than anyone else that unprecedented conditions call for new methods, that they must be open-minded to every criticism sincerely directed toward winning the victory. They know that no one can afford to be smug in the face of a national crisis.

There would be no point to my rehearsing here the pros and cons of such criticisms. Time is too short for that. Only in its performance can industry write a convincing answer to its critics. But as a help toward the achievement of that performance, I should like to clear up, if I can, one prolific source of misunderstanding and mistrust.

I refer to the solicitude of industrial managers as to where their companies may find themselves after the war. *This concern for the future sometimes is misinterpreted to mean that management is blind to the urgency of the present. But it does not mean that. It is a perfectly natural anxiety that must be felt by any responsible management operating under the American enterprise system – which is one of the things we are fighting to preserve.*

Under our system, the managers of industry cannot but feel a sense of responsibility to its owners, not merely for current dividends on their investments but also for the conservation of their properties That means they must feel some concern over what may happen after the war to a business that now must go all out to help win the war. And their concern is but part of a general concern over what may be the effect of the war on the whole American way of life, preservation of which is our reason for being at war.

To give practical effect to that concern under present conditions is one of the problems of management. It is not an insuperable problem. Competent management will be able to surmount it, I am sure. But the right kind of help from those in authority can make the job a lot easier. And let us note in passing that the problem cannot be written off, as some critics of business seem to think, merely by setting off against it the profits that business can make on war contracts. That misses the whole point.

For a business enterprise is not, as many seem to think, just a "profit-machine." It is not set up and operated by its owners and managers for the sake of this month's or this year's profits, without regard to any other consideration.

The fact is that any worth-while business must operate as a going concern. It consists not only of stockholders and managers, but also of employees, markets, distributors, and dealers. Mostly, I might say, of markets, distributors, and dealers. They are the "reason for being" of any business, the source of its payrolls and its profits.

No competent management wants to scrap such essential elements of its business just for the sake of war-bred profits, however large they might look . . . at the moment. Most of the original reluctance to get into arms production, for which industry has been criticized, was not due to a "greed for profits", as has been charged. Rather did it arise from management's mistrust of "war profits" that can be made only by sacrificing the essential elements of a healthy business.

* * *

But now industry faces a dire national emergency. The survival of our country and all its institutions – including American business–is at stake. So management must shape its course to meet without stint every need of the war

effort. That means it must subordinate to that effort every other concern. To lose the war is to lose all. We must first win the war if we would save anything.

To the men of management that presents a grave responsibility. It is fair to ask whether government can do anything to help them meet it. One simple thing I think government can and should do. It cannot dissolve all the concerns of management, but it can help substantially.

Government should do all it can to help management conserve those assets of business that will contribute to post-war reconstruction, when that can be done without prejudice to getting on with the war.

Let me explain. Broadly speaking, every business comprises three elements. One is its tangible assets — its factories, machinery, equipment, and materials. Another is its productive capacity — its management, organization, trained working force. A third is its intangible assets — the goodwill, familiarity, acceptance, and recognition that it enjoys amongst its dealers, customers, and prospective customers.

When the nation goes to war government becomes the one dominant customer of a business. Of these three elements, the first two — plant facilities and organization — become of paramount importance to the job in hand. But so far as the government buyer is concerned, the third drops to minor importance.

But that third element cannot be ignored by the managers responsible for that business. For it will be their mainstay when they must rebuild that business after the war, when government has lost all interest in its existence, except as a source of tax revenue. That is why government can help greatly if now, during the war, it recognizes the legitimate concern of management to conserve those assets that will be essential to survival after the war.

Everyone recognizes the obligation of government to demand that the individual business go all out for war production, to forbid the production of goods not essential to wage war and to commandeer those that are, to require that a business sacrifice its markets and disrupt its distribution organization. No one questions the right of government to restrict arbitrarily the amount of earnings that a business may retain as profit from its war activities. In short, no one questions the right of government to become the dominant partner in any business that may be needed to win the war and, as dominant partner, to put the national need above any conflicting interest of the business.

But, as it does all this, government should remember that the survival of that business is staked on the public's knowledge and use of those discontinued or commandeered products, on the stability of that crippled dealer organization, on the ability of the business to maintain its standing in a market-place from which, temporarily, it may be barred.

And government can help management to deal with the exacting task it now faces, if it will do all it can to avert the needless sacrifice of business interests that do not conflict with war needs, if it will but remember that one of these days, that business again will be on its own, gathering up whatever resources it may have left, recreating its markets, rebuilding its distribution channels, reestablishing itself as a going concern . . . and doing all this in a competitive world without benefit of war orders.

The only foundation upon which any business can hope to rebuild when that day comes is its customers' memory of its name and their understanding of its products. Whatever credit may be coming to it for its war effort will not avail it very much if it permits itself to be forgotten. Its chief assets in that day will be the identity, recognition, and acceptance it still enjoys amongst those to whom it must look for business.

That is why so many business men, already going all out on their war jobs, become apprehensive whenever some word or act of a legislator or government official seems to question the validity of their sales, promotion, and advertising activities during the war. For they know that it is by such measures alone that any management can hope to conserve — while its business goes to war — the values it will need when it returns to civilian service.

That is why I ask government to do all it can to allay such uncertainties, to reassure business of its desire to help conserve those intangible assets that mean so much to business security. For that, I believe, will strengthen the hand of management in a big way as it goes all out on the vital job Donald Nelson has staked out for industry.

* * *

He has told us that if we are to make these ten silver months productive enough to make up for the golden months that are gone, industry must do things it never thought it could do. That is dead right. For America now finds itself in a position it never thought it could be in.

All too slowly, but very surely, it is dawning upon us that this is OUR WAR. Moreover it was our war long before we knew it or did much about it. So our job today is not merely to match the current production of our enemies. That is not enough. We must produce also enough to match the surplus of resources they had built up before we got started. We must produce enough not only for our own needs, but also for all the United Nations.

Moreover we must produce all that we need for decisive victory, for anything short of that will mean defeat. If we would save the American way of life, we must destroy once and for all the forces that threaten it. A stalemate would mean but an armed truce and what that might do to the American way of life and to American industry no one dares to guess. Victory must mean decisive victory. And this, very definitely is our war.

And just as definitely, this is OUR YEAR. For in this year — 1942 — we must prevent our enemies from achieving an advantage that might put victory forever beyond our reach — despite all our vast resources. It is an appalling fact that victory may slip beyond our grasp — not in 1943 or in 1944 — but during the months just ahead of us.

"Industry's responsibility in all of this is great," says Donald Nelson. "The job will take brains and initiative, but we can do it if we go out with a will."

To Mr. Nelson, that initiative means that industry must lead rather than follow in the march to more intensive use of our machines and our man-power. We dare not wait for new facilities to meet our mounting needs. More and more we must press for more widespread subcontracting and conversion. And he is counting on that initiative, backed by ever more aggressive effort, to avert or to minimize the compulsory measures that now seem imminent.

"We must stop thinking about what we're going to do to the enemy in 1943 and start thinking of what we're going to do to him in March of 1942. We must make today the things we would be making next year . . . if we had the time to spare."

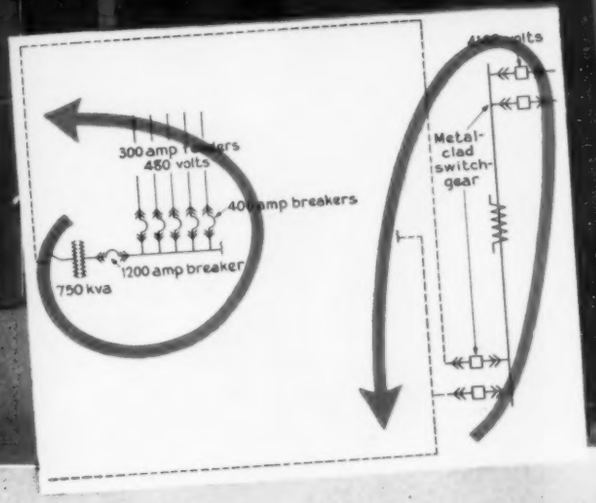
That, says Donald Nelson, is the task of American industry during the next "Ten Silver Months." And to that gigantic task American industry now must bend every ounce of its abundant strength.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

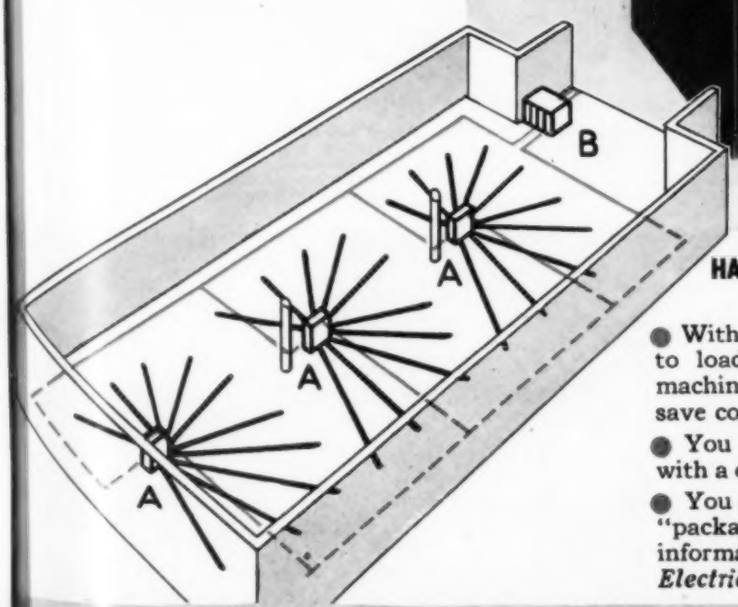
A SIMPLE ONE-LINE DIAGRAM PUTS US TO WORK ON STANDARD EQUIPMENTS



A *Load-center Unit Substations*—including transformer and high- and low-voltage protective and disconnecting devices, all co-ordinated as a single, safe, compact, easy-to-install unit.

B *Metal-clad Switchgear Equipments*—for protecting primary circuits up to 15 kv. A safe, co-ordinated assembly of breakers, instrument transformers, buses, and associated equipment.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.



HAVE LOAD-CENTER POWER BEFORE THE FIRST MACHINE IS READY TO ROLL

- With load-center distribution, power at high voltage goes right to load-center unit substations, and then directly to your machines through *short* low-voltage secondary feeders. You save copper, steel and dollars.
- You can order *standard* G-E load-center equipments *early*—with a one-line diagram. Get everything you need—weeks sooner.
- You get them ready to set in place and connect—in compact "packages" that can be put in otherwise "dead" area. For full information, contact your nearest G-E Office, or write *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

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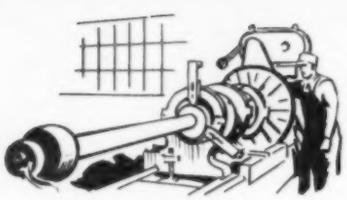
P.I.V. THE ONLY ALL-METAL, POSITIVE VARIABLE SPEED CHANGER

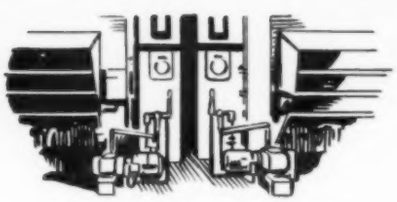
Increases Machine Flexibility

With the P.I.V. Gear as an integral part of this modern tube mill, operating speeds can be altered quickly and easily to suit the size and composition of the tubing and welding method employed.



New Machine From Old

By installing a P.I.V. Gear and individual motor on an unused lathe, a prominent manufacturer transformed it into a production boring mill at a fraction of the cost of a new boring mill if one could have been obtained.



Boosts Boiler Efficiency

Operating 6 boilers with pressure control to regulate fuel bed conditions through P.I.V. Gears driving stokers, increased boiler efficiency 8%. One year's fuel saving alone repays cost of entire installation.

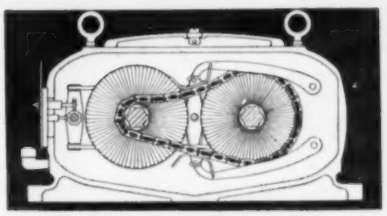
The universal acceptance of the P.I.V. Gear is due to its ability to cut costs, improve quality, save power, run at most productive speeds, eliminate production steps and end expensive change-overs and line stoppages, in widely varying types of industrial plants. It meets every speed varying requirement. All elements of the P.I.V. Gear are fully-enclosed in a rigid, compact, all-metal housing. Operation is safe, clean and unaffected by atmospheric conditions.

All moving parts operate in oil. Seven sizes and five types, all suitable for horizontal or vertical mounting, permit great latitude of installation in small space. This unit can be installed in line with the prime mover or adjacent to it or can be incorporated as a built-in unit. Send for Data Book No. 1874. Link-Belt Company, Philadelphia, Chicago, Indianapolis, Atlanta, Dallas, San Francisco, Toronto. Offices, warehouses and distributors in principal cities.

There's Production Magic FOR VICTORY in this Unique Device!

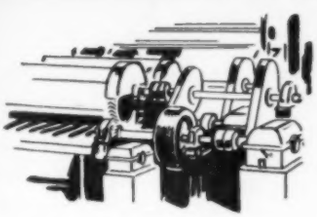
By simply turning the hand wheel on the P.I.V. Gear, the ideal speed for each operation is obtained instantly, while machine is running. Can also be arranged for automatic, manual, vernier, direct or remote control.

Because there is no possibility of slippage in the drive and because speed changes are made while running, the P.I.V. Gear is continuously variable, providing an infinite number of speeds within its range and without steps.



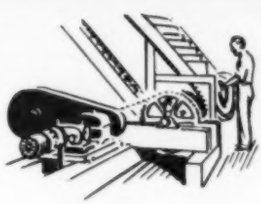
The P.I.V. Gear is the only speed changer to employ a positive chain drive, thus assuring maintenance of the speed selected. Ends guesswork and speed hunting—widens the range and increases machine efficiency.

GET THE UTMOST FROM YOUR MACHINES IN CAPACITY AND QUALITY . . WITH THIS POSITIVE SPEED CHANGER



Cuts Production Steps

Accurately controlling the speed of knives on a box board cutting machine through a P.I.V. Gear replacing a cone pulley drive, eliminated waste from under-size sheets and saved in both time and production costs.



Reduces Production Discards

Accurate Speed Control on a singeing machine in a bleachery accomplished with a P.I.V. Gear, eliminated guesswork on a delicate operation and reduced discards.

Increases Capacity 25%

The productive capacity of the roll-machining lathes in a steel mill was increased as much as 25% by using P.I.V. Gears in place of previous drives that made it difficult to groove the rolls to exact diameters.

LINK-BELT P.I.V. GEAR

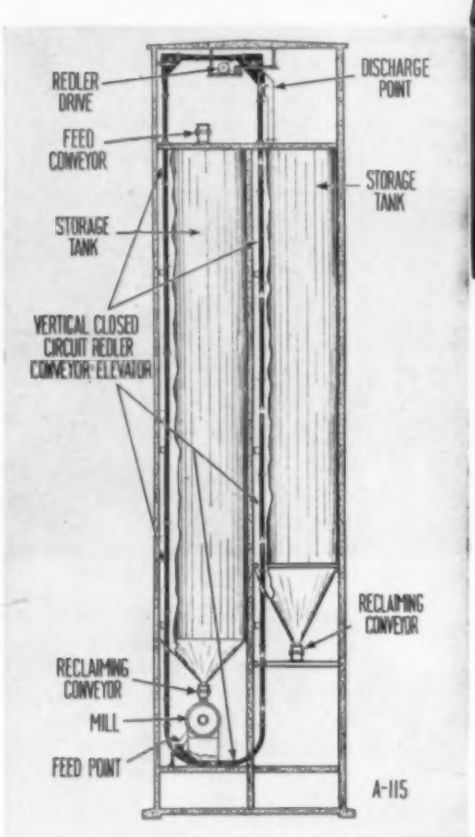
POSITIVE INFINITELY VARIABLE SPEED CONTROL

SIMPLIFY and SAVE...

Use

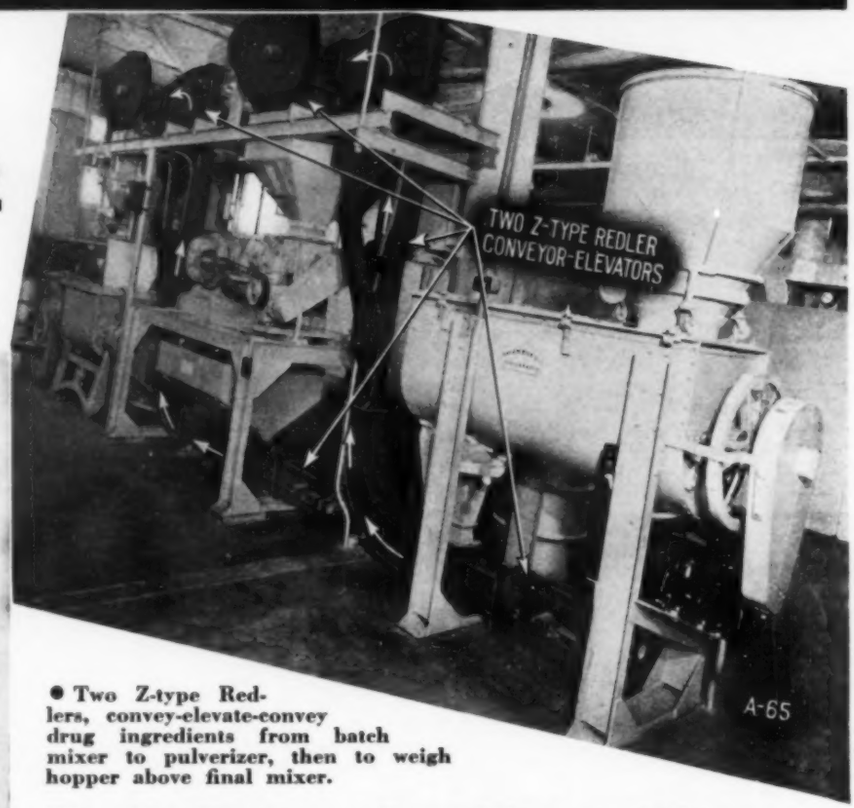
REDLER

Self-Feeding Conveyor-Elevators



● Double-leg Redler Elevator, 68 feet high, transfers soy beans from mill beneath one tank to another tank . . . without dust or danger. Hundreds of other arrangements possible.

● **Write for Redler Catalog 140**— 64 pages of engineering data . . . installation photos and dimensions.



● Two Z-type Redlers, convey-elevate-convey drug ingredients from batch mixer to pulverizer, then to weigh hopper above final mixer.

Handle Better...Save Time and Space With Minimum of Equipment

● Over 12,000 successful Redler installations conveying-elevating pulverized, granular, fine-lump and flake material.

● Handle gently, with minimum breakage . . . materials flow *en masse* through the enclosed casing . . . horizontally, vertically, around curves . . . wherever the compact casing directs it.

● Prevents contamination from outside sources . . . eliminates dust and explosion hazards.

● Redlers feed themselves full, uniform loads direct from bins or hoppers.

● One unit will convey-elevate . . . often does the work of two or more ordinary conveyors . . . simplifies drive and control problems and reduces installation and framing outlay.

● Redlers can be made self-cleaning to handle more than one material in one system.

● Quickly and easily erected in ½ to ¼ of the usual space.

Move with S-A Conveyors

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STEPHENS-ADAMSON MFG. CO.

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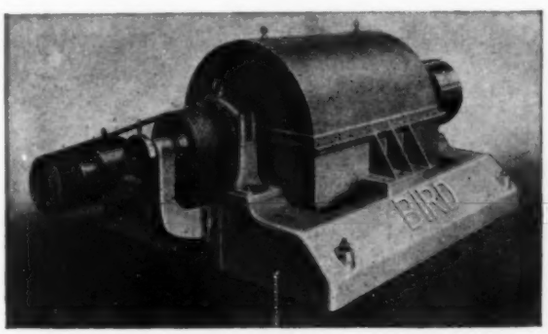
Belt Conveyors · Pan Conveyors · Redler Conveyors
SealMaster Ball Bearings
Bucket Elevators · Feeders · Skip-Hoists
Crushers · Screens · Winches and Car Pullers

FOR STEPPING UP PRODUCTION

BIRD *Continuous* CENTRIFUGAL FILTRATION

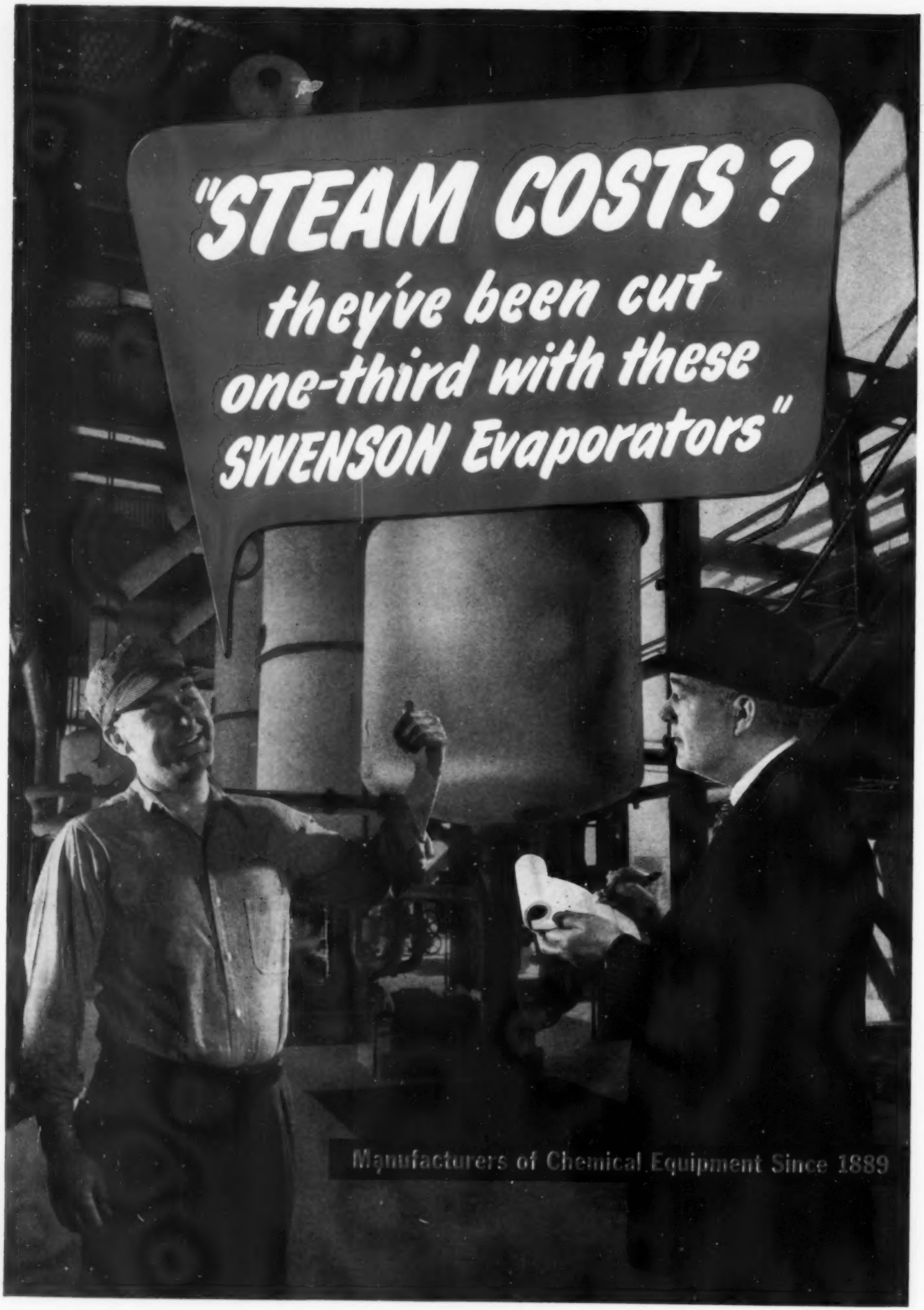
is helping a constantly growing number of producers of vital-for-victory materials to "beat the promise".



The Bird Centrifugal Filter handles crystalline or amorphous, coarse or fine solids in thick or thin, hot or cold slurries. Operation is clean, rapid, continuous, totally enclosed, — and fume-tight, if desired.

The number and variety of filtering applications for which this has been conclusively demonstrated warrants the suggestion that you **find out what the Bird Filter can do to step up your production-for-victory effort.**

BIRD MACHINE COMPANY
SOUTH WALPOLE · MASSACHUSETTS


"STEAM COSTS ?
they've been cut
one-third with these
SWENSON Evaporators"
Manufacturers of Chemical Equipment Since 1889

FOR LOW-COST EVAPORATION- YOUR EVAPORATORS MUST BE SPECIALLY ENGINEERED FOR THE JOB

The success of your evaporator installation depends on how well the equipment is designed to fit the specific conditions under which it must operate. Type and size . . . choice of materials . . . steam balance . . . entrainment prevention . . . all of these are factors which have a direct bearing on equipment life and the economy of operation.

Years of experience in handling evaporator problems have brought Swenson engineers in contact with the most unusual conditions. They have successfully designed high efficiency equipment to meet those conditions, resulting in important savings to the process industries.

Swenson Builds Evaporators of Every Known Type

In determining the evaporator equipment best suited to your particular needs, Swenson engineers are in no way limited as to type —for Swenson is equipped to produce economically every type that is known. In fact, a majority of the most important developments in evaporator design and construction are products of Swenson research.

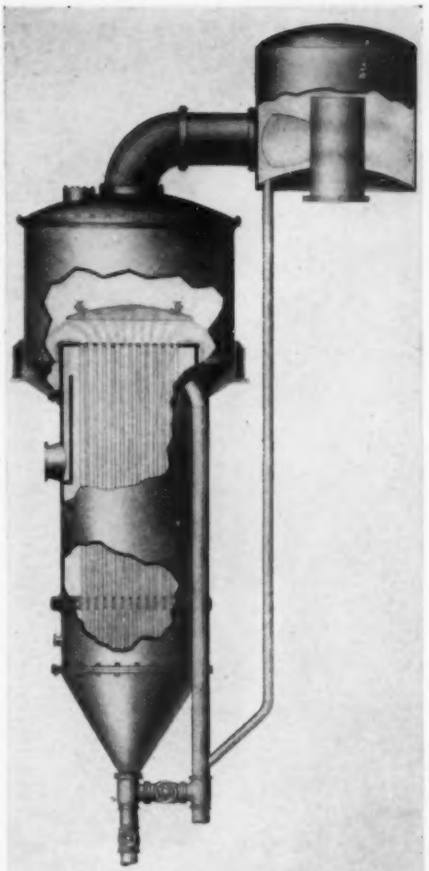
Research and Development

Swenson leadership is based on a continuous program of investigation and research. The very latest technical information is constantly at the disposal of Swenson engineers to assure each customer the most advanced construction for efficiency in any application.

Swenson Five-Way Service

With its engineering facilities and extensive field force, Swenson gives its customers a complete Five-Way Service that covers every detail from the analysis of individual requirements to the assurance that these requirements have been efficiently met.

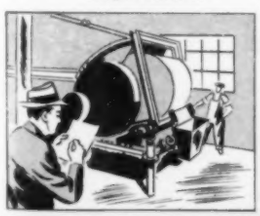
SWENSON EVAPORATOR COMPANY
Division of Whiting Corporation
15669 Lathrop Ave. Harvey, Ill.



One of Swenson's outstanding developments is the Long-Tube Vertical Type Evaporator, especially suited to concentration processes where no salting occurs. It can be used to concentrate mobile and foamy liquids automatically with no appreciable entrainment loss; also delicate substances whose quality is affected by temperature and time. Complete information on request.

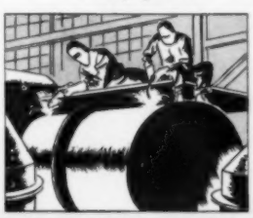
ONLY SWENSON PROVIDES THIS FIVE-WAY SERVICE

1. Analysis of Requirements

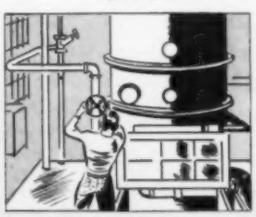


2. Design and Layout

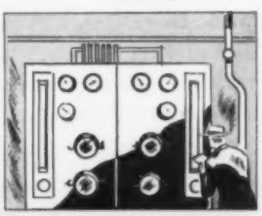
3. Manufacture of Equipment



4. Test Operation

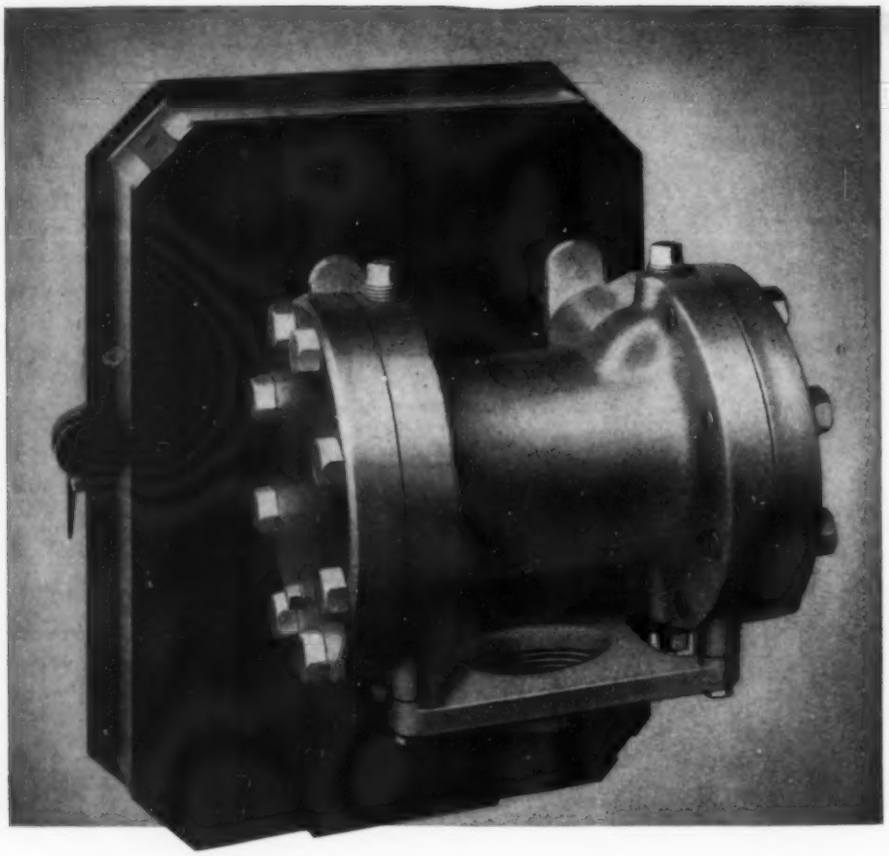


5. Periodic Check-ups



SWENSON

EVAPORATORS • FILTERS • CRYSTALLIZERS



Announcing THE TAYLOR ANEROID FLOW MANOMETER

NO MERCURY . . . NO STUFFING BOX . . . NO PIVOTS

HERE it is . . . the new mercuryless manometer for Taylor flow and liquid level instruments. Already enthusiastically received by many plants after exhaustive field tests. Saves mercury for the war effort. Improves production, simplifies maintenance. Solves hitherto insurmountable problems in the handling of new chemicals.

1. NO MERCURY. Differential pressure is measured by a stainless steel bellows. No contamination of product. No worry about theft or "blowing" . . . no cleaning. Sealing fluids rarely required . . . no leveling of instrument necessary.

2. STUFFING BOX REPLACED BY TORQUE TUBE. No leakage. No friction. And *no lubrication* or other maintenance!

3. NO INTERNAL PIVOTS—NO SPRINGS. No friction, lost motion, or wear.

4. RANGE EASILY CHANGED by interchangeable pre-calibrated torque tubes.

5. FASTER RESPONSE, approaches closely actual rate of flow. Greater sensitivity to variation in flow.

6. ADEQUATE PROTECTION against over-ranging and reversal of flow.

7. NO "WET-LEG" corrections needed.

8. PIPE TAPS AT TOP OR BOTTOM of manometer body give free access to interior mechanism without breaking pipe connection.

9. NUMEROUS RANGES AVAILABLE . . . 0 to 20, 50, 100, or 200 inches of water. Intermediate ranges also available. 0 to 300, 400, or 500 inches on application.

If you have flow or level problems —if you are struggling with new acids or chemicals—if you must avoid a manometer stuffing box—if you cannot get mercury—if mercury contaminates your product—you should investigate these new Taylor Aneroid Manometer Instruments.

Your Taylor Field Engineer can show you exactly how it works and why it's better. Call the nearest Taylor office, or write Taylor Instrument Companies, Rochester, N. Y. or Toronto, Canada.

Taylor

Indicating Recording Controlling

TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS

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Long before Pearl Harbor, BUFLOVAK Catalogs describing Modern Processing Equipment, were prepared and compiled from the user's point of view. Information that is helpful or useful to a customer or prospect comes first.

The general application of equipment to process and products is carefully followed as far as the many and varying uses permit.

Today, such information is doubly valuable. New processes are required for new products. These replace changed methods in the food, chemical, plastic, processing and other industries.

Drying Evaporation, Solvent Recovery and Processing, have assumed new importance, particularly where materials, time and power must be saved.

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The entire facilities of the Research Department, Testing Plant and Field Service Engineers, are at your disposal. These cooperative engineering services are intended for your assistance. Complete information and advice will be given without cost wherever practicable. More extensive engineering information can be covered by a nominal fee, without any further obligation, and in the strictest confidence.

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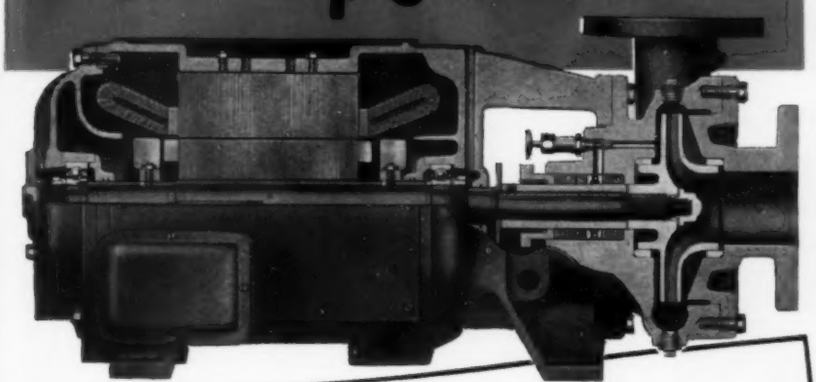
Furnacing	Drying	Gas Cleaning
Cracking	Mixing and Stirring	and others

FOR TRIPLE-SHIFT DUTY!

ALLIS-CHALMERS ELECTRIFUGAL PUMPS



New Allis-Chalmers "One Package" Pumps are 5-Way Winners in Giving You More Pumping Dependability!

THREE SHIFTS a day . . . efficient, dependable, economical operation every day of the week — that's what wartime industry expects of its pumping equipment.

And that's exactly the kind of service you get with the new Allis-Chalmers Electrifugal Pump . . . better in 5 important ways!

For with this new pump — compact construction with motor and pump on one shaft and in one housing saves you as much as 33% in space, cuts pump overhang as much as 40%. Unified "Tri-fit" design requires but three of the five section fits normally required . . . resulting in fewer parts to wear and more positive shaft alignment.

In addition — you get a new motor, completely splash-proof, 100% designed for pump drive . . . with indestructible rotor and distortionless stator.

Important too—these pumps are available to you in sizes from ½ hp to 25 hp (in most cases right out of stock) . . . at an actual saving to you in initial cost of up to 33%.

For complete information on this "one package" pump, call the engineer in the district office near you. Or write Allis-Chalmers, Milwaukee, Wisconsin.

A 1496

Check These Great One-Package Features

1. *Up to 33% Space Saved* with one frame, one solid driving shaft construction.
2. *Overhang Cut as Much as 40%.* Four solid supports assure precision balance . . . ease strain on vital parts.
3. *New Tri-Fit Design* eliminates 2 section fits for more positive shaft alignment, wearless and vibration-free performance.
4. *Splash-Proof* Motor standard equipment . . . 100% designed for pumping.
5. *Easy-to-Get-at* Casing simplifies stuffing box and waterseal gland inspection.

Allis-Chalmers Pumps Can Cut Your Pumping Costs

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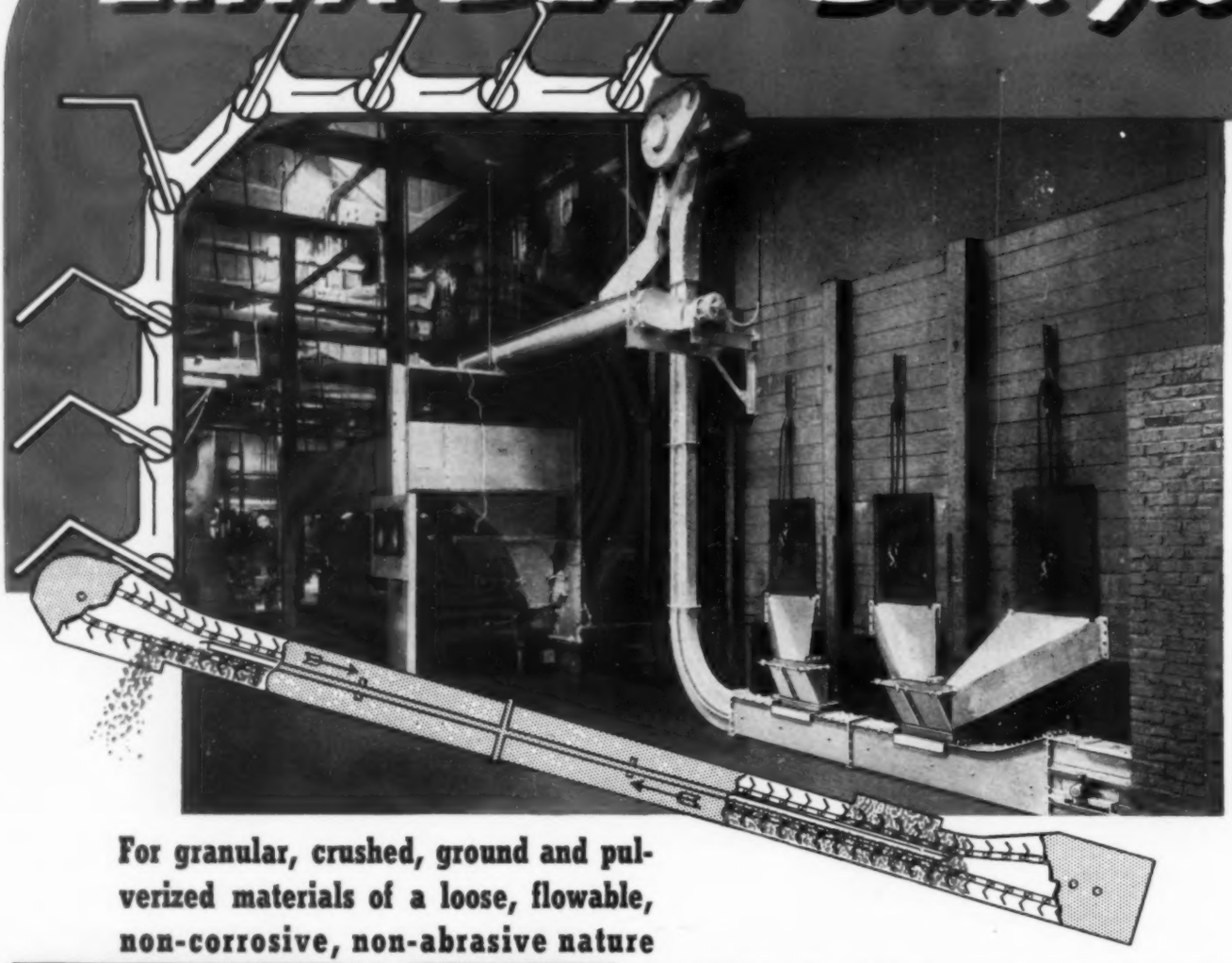
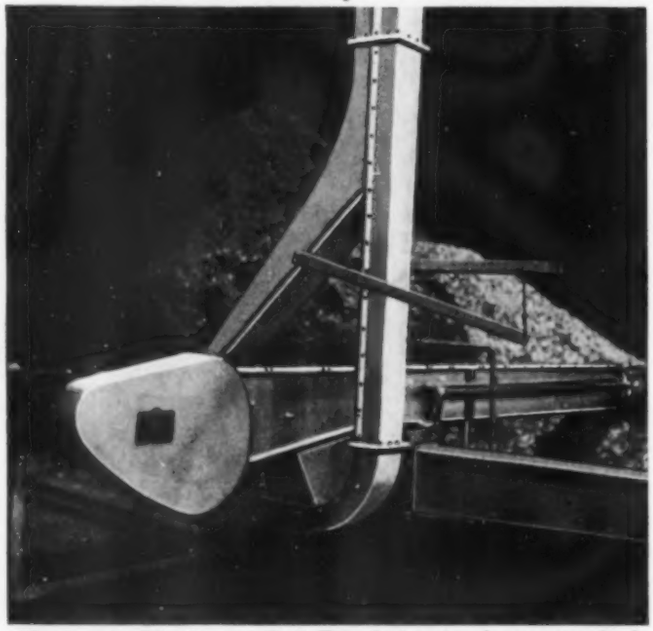
LINK-BELT Bulk-Flo



For granular, crushed, ground and pulverized materials of a loose, flowable, non-corrosive, non-abrasive nature



Head end of horizontal Bulk-Flo discharging into a standard loop-boot Bulk-Flo unit.

● The Link-Belt Bulk-Flo conveyor-elevator-feeder cuts handling costs of such materials by removing the limitations of alternate methods. It moves materials in compartments, the way a train does; but the "cars" operate in an endless train—horizontally, vertically, on slants of any degree, around corners, in many combinations.

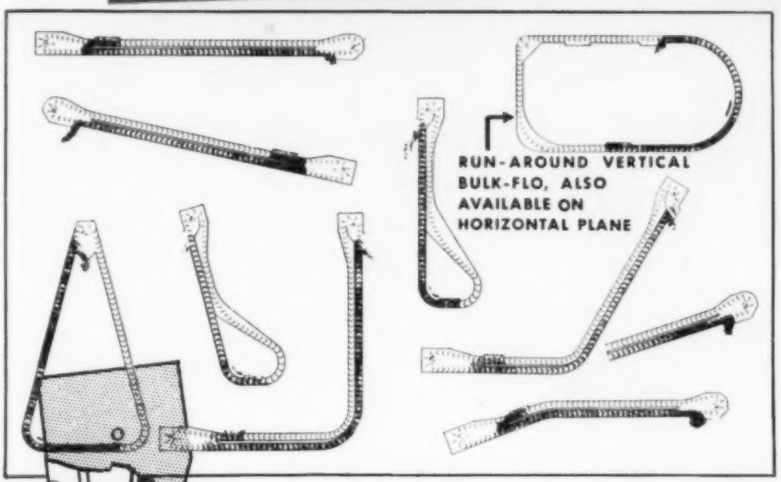
The moving element of the Link-Belt Bulk-Flo conveyor-elevator-feeder is a specially designed chain with peak-shaped cross-flights at each pitch, forming the series of compartments which hold the material. This design gives you automatic feed . . . quick, clean discharge without carry-over . . . smooth, reliable, low-cost operation. Installation requires only a fraction of the space of other conveyors and elevators; and you save also on supporting structure. Extreme flexibility of layout makes possible a simple, low-cost solution to what might otherwise be a complicated, expensive handling problem.

Our engineers will welcome the opportunity of working with you on your handling problems, whether suitable for Bulk-Flo or other equipment. We are specialists on cost cutting with all material handling methods.

The Advanced HANDLING METHOD

Self-feeding ELEVATOR-CONVEYOR

The Most Flexible and Compact Type of Elevator-Conveyor for Bulk Materials

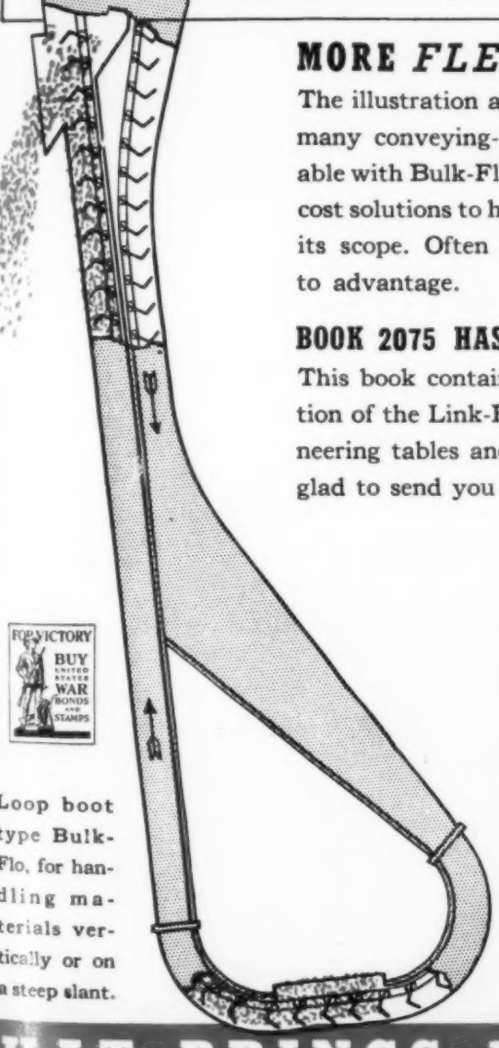


MORE *FLEXIBLE*

The illustration above shows some of the many conveying-elevating layouts available with Bulk-Flo to provide simple, low-cost solutions to handling problems within its scope. Often tandem units are used to advantage.

BOOK 2075 HAS FULL INFORMATION

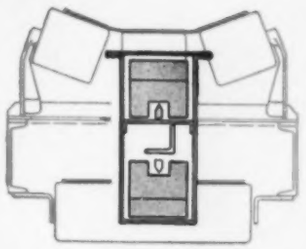
This book contains a complete presentation of the Link-Belt Bulk-Flo with engineering tables and illustrations. We'll be glad to send you a copy.



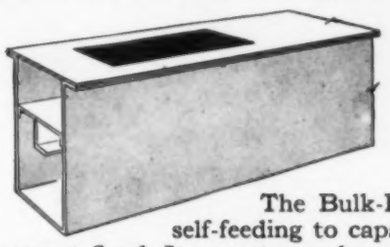
Loop boot type Bulk-Flo, for handling materials vertically or on a steep slant.

SAVES SPACE

The Bulk-Flo conveyor-elevator-feeder requires considerably less space than alternate equipment. The illustration shows a comparison with a belt conveyor as to space needed.



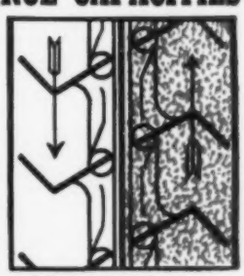
SELF-FEEDING, ENCLOSED



The Bulk-Flo is self-feeding to capacity. It cannot flood. It operates under partial loading with as high efficiency as under full load. The load is distributed along the conveying element with minimum slip whether loaded fully or in part. At the end of a run, all material is cleared from the duct. Important when different materials are handled in one conveyor.

SLOW SPEED: LARGE CAPACITIES

Because the material in a Bulk-Flo conveyor-elevator-feeder moves en masse, the speed is slow; usually 30 to 60 feet per minute. Large capacities are obtained by large duct cross section rather than by high speed.



Endorsed by Industry

Although the Bulk-Flo is the youngest member of the Link-Belt family, a considerable number of units have been installed and are operating with complete satisfaction.

LINK-BELT COMPANY

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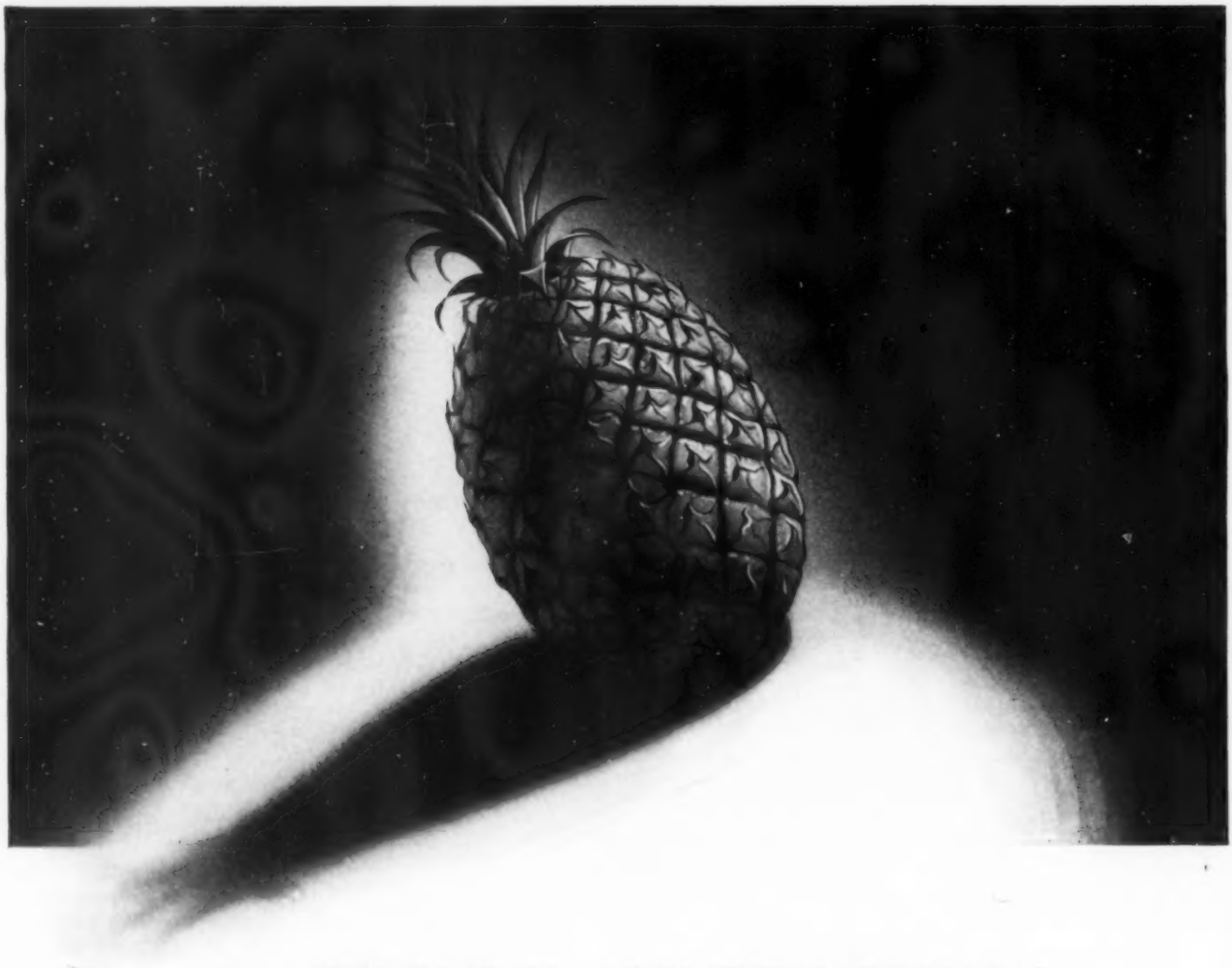
D THAT BRINGS NEW BENEFITS . . .



TOUGH CUSTOMER!

Take a look at this . . . then consider about a pint and a half of pure yellow juice. A big order, but that is what the beverage industry expects from the average pineapple . . . and that is what it gets.

Fifteen years ago this statement could not have been made. A pineapple *was* a pretty tough customer. Armored shell disposed of, the crushed pulp contains fibres, grit and foreign matter . . . all of these filtration removed but left an almost colorless liquid of inferior nutritive value . . . and far from the pineapple juice we drink today. Centrifugal force scientifically applied gave the desired answer.

At high rates of through-put the Sharples Super-Centrifuge was able to select between the undesirable solids and those proteins and albumens that contribute so much to taste and nutrition.

There is no other way in which the wanted and unwanted solids can be so separated, and Sharples Centrifugals have become standard equipment in the pineapple and many other fruit juice industries.

THE SHARPLES CORPORATION

★ CENTRIFUGAL AND PROCESS ENGINEERS ★

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U.S.I. CHEMICAL NEWS

June ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1942

New Addition Agent Ends Corrosion of Iron by Lacquers

Forms Film to Protect Surface Of Unlined Steel Containers

EVERETT, Mass.—The tendency of clear lacquers, alcoholic shellacs, and nitrocellulose solutions to corrode plain steel containers can be overcome by the addition of small quantities of a new organic chemical.

This announcement by a manufacturer here suggests interesting possibilities for lacquer packaging during the current limitations on tin supplies. Because of the relatively low cost of the new chemical, it is believed that its use may continue after the tin shortage is relieved.

The chemical, it is explained, reacts with the metal surface of the container to form an insoluble film, which, though of microscopic thickness, is sufficient to afford the necessary protection. Because of the nature of its formation, the film is self-mending in case of breaks.

Only small quantities are needed to produce the desired effects, it is reported. In normal clear lacquers, about one-half ounce of the chemical per gallon of lacquer is sufficient.

Information on source of supply of the new chemical can be obtained from U.S.I.

Coating Improves Wetting Characteristics of Rubber

AKRON, Ohio—The wetting characteristics of rubber surfaces can be greatly improved by the simple expedient of applying a very thin coating of rosin. The coating is of particular value in applications such as fountain pens or rubber-covered rolls for paper mills, in which the rubber is subjected to contact with watery materials.

These claims are made in a patent granted to an inventor here, who says that the coating is more effective than treatment with most commercial wetting agents. A particularly satisfactory coating can be obtained with a solution of 2% by weight of ordinary gum rosin in acetone. Other solvents that can be used include ethanol and butyl acetate.

Rosin coating on feed member of fountain pen improves wetting characteristics and ink flow.

A. A. Backus Dies; Was in Charge of Production for U.S.I.

Arthur A. Backus, Vice-President in Charge of Production of U.S.I. since 1928, was fatally injured on May 18 when he accidentally fell from a train en route from his home in Stamford, Conn., to New York.

During his many years with U.S.I., he rendered invaluable services to the company, serving as Director of Research from 1916 to 1924, and as Production Manager from 1924 to 1928. In 1928 he was appointed to the position which he held until the time of his death. He was also a director of Stroock & Wittenberg Corporation, Cuba Distilling Company, Dominican Molasses Company, and Porto Rico Mercantile Company.

A. A. Backus

He was a member of the American Chemical Society, American Institute of Chemical Engineers, Society of Chemical Industry, the Chemists' Club of New York, and the Uptown Club.

His loss will be keenly felt by all who associated with him, as well as by the chemical industry as a whole, the progress of which was materially aided by his valuable contributions.

Determinations of flash points for the various formulas of industrial alcohol, recently conducted at U.S.I.'s laboratories, show values considerably higher than those now listed in the Industrial Alcohol Catalog. A new data sheet has been prepared, listing revised flash points for pure, C.D., and S.D. alcohol, as well as for alcohol-water mixtures. Copies of the data sheet can be obtained free of charge from U.S.I. Ask for Bulletin FP.

Users Asked to Return Empty 55-Gallon Drums

Users of U.S.I. products are urged to return all empty 55-gallon drums as promptly as possible, to alleviate the container shortage.

U.S.I. suggests that as soon as two or more drums have been emptied, they should be turned over to the nearest freight agent for shipment to U.S.I. Large users should ship full

carloads of 276 drums wherever practicable. Return freight will be paid by U.S.I., and credit will be given at full ceiling price for all drums which are received in good condition, and which have not been used for storage of materials other than original contents.

To comply with Federal regulations, all markings on head of drum must be obliterated as soon as drum is emptied.

Partition Analysis Best in Cellulose Mixed Ester Tests

Butyl Acetate Gives Accurate Results in Determinations

Of the various methods which have been proposed for determination of the combined acids in cellulose mixed esters, best results appear to be obtained by differential partition of the acids between immiscible solvents, according to reports of research work conducted by a leading producer of the mixed esters. Especially satisfactory results are obtained when water and normal butyl acetate are used in the determinations.

The cellulose mixed esters, such as cellulose acetopropionate and cellulose acetobutyrate, owe much of their popularity to the fact that it is possible to vary their properties within certain limits by varying their composition. Hence there is need for a practical, accurate method of analysis as a check on composition, and considerable study has been devoted to the subject. It has been found that, by means of the partition method using butyl acetate, commercial cellulose acetobutyrates and acetopropionates can be analyzed with an accuracy of about ± 0.2 weight per cent acyl.

Uses of Mixed Esters

The cellulose mixed esters offer interesting possibilities for use in cases in which cellulose acetate does not have all the desired properties. In general, the mixed esters are characterized by a wider range of solubility and compatibility, and are more resistant to water and

(*Continued on next page*)

The equipment shown here is employed in the research work constantly carried on at U.S.I. to develop new acetoacetarylides and improve the quality of existing ones. These compounds are used as intermediates in the manufacture of yellow pigment dyestuffs characterized by excellent color tone, brilliance, and durability. Acetoacetanilide, acetoacet-ortho-chloroanilide, acetoacet-para-chloroanilide, acetoacet-ortho-toluidide, and acetoacet-ortho-anisidide are in commercial production at U.S.I., and samples of many other acetoacetarylides can be supplied for laboratory investigation of their potentialities.

ADVERTISEMENT—*This entire page is a paid advertisement.*

June ★ **U.S.I. CHEMICAL NEWS** ★ 1942

Studies Reveal Further Uses for Ethyl Carbonate

Additional light is thrown on the potentialities of ethyl carbonate by recently published papers, which supplement the information on the reactions of this chemical as given in the April, 1942, issue of U.S.I. CHEMICAL NEWS.

One of these papers discusses the synthesis of malonic esters from esters of monobasic acids in accordance with the general equation:

$$R'CH_2COOR + (RO)_2CO + MOR \rightarrow [R'C(COOR)_2]M + 2ROH$$

A second paper describes the synthesis of beta-keto esters by the condensation of alkyl carbonates with ketones according to this equation:

$$R'COCH_3 + (RO)_2CO + MOR \rightarrow [R'COCHCOOR]M + 2ROH$$

Another recent investigation deals with the synthesis of alpha-cyano esters by condensing nitriles with alkyl carbonates:

$$R'CH_2CN + (RO)_2CO + MOR \rightarrow [R'C(CN)COOR]M + 2ROH$$

It has also been discovered that the alkyl carbonates, contrary to previous beliefs, are excellent alkylating agents for malonic esters, and are as useful in this respect as the alkyl halides and sulfates. Most monosubstituted malonic esters were found to be readily alkylated by heating the metal derivatives with alkyl carbonates:

$$[R'C(COOR)_2]M + (RO)_2CO \rightarrow R'RC(COOR)_2 + RMCO_3$$

Alkyl carbonates have also been found useful as reaction media for metalating or alkylating a variety of malonic, beta-keto, and alpha-cyano esters. The substitution of alkyl carbonates for ethanol as the reaction medium prevents the cleavage of a carbalkoxyl group by alcoholysis as an undesired side reaction. Two general types of alkylation that were investigated are shown by the following equations:

$$[RC(COOC_2H_5)_2]M + R'Br \rightarrow RR'C(COOC_2H_5)_2 + MBr$$

$$[CH_3COCRCOOC_2H_5]M + R'Br \rightarrow CH_3CORR'COOC_2H_5 + MBr$$

Good yields were obtained with ethyl carbonate as the reaction medium in certain cases in which only insignificant yields had previously been obtained.

While the equations have been presented in general form applying to alkyl carbonates, ethyl carbonate was actually used in most of the work. The metal used (denoted by M in the equations) was usually sodium, and was removed from the product by acidifying with acetic acid. Those reactions in which an alcohol was a product could be readily pushed to completion by stripping off by distillation any alcohol produced and any originally contained in the mixture.

Succeed in Fractionating Soybean Oil Phosphatides

LAFAYETTE, Ind.—The commercially useful phosphatides in soybean oil can be recovered by adsorption on a solid adsorbent, followed by successive extraction with organic solvents, it has been discovered by research workers here.

The solvents employed are acetone, ether, absolute ethanol, and 50% ethanol. The acetone extract has been found to consist largely of oil with some phosphatides, sterols, and sterol glucosides. The ether extract contains material with the physical properties usually ascribed to phosphatides, but with a P:N ratio of about 2:1.

The material abstracted by absolute ethanol has a P:N ratio of about 1:1, and is apparently at least 50% true phosphatides, with more lecithin than cephalin. Extraction with 50% ethanol yields lecithin and cephalin also, and in addition acidic material which can be hydrolyzed with acids to form large quantities of sugar. This substance has marked foaming properties.

The ether fraction can be further extracted with ethanol to yield a viscous liquid which is soluble in acetone and has good emulsifying properties.

Partition Analysis of Cellulose Mixed Esters

(Continued from preceding page)

alkalis. They can be used in the formulation of clear metal lacquers for the protection of brass, bronze, copper, aluminum, magnesium, and steel, and produce durable, weather-resisting coatings. Finishes of this type have been used in the protection of bronze statuary.

While the cellulose mixed esters are somewhat higher in cost than certain other lacquer bases, this factor is partly offset by their solubility in common solvents, and by their ability to produce finishes of superior characteristics. Cellulose acetopropionate is frequently used in a solvent mixture of equal parts of ethanol and toluol. A mixture of SOLOX and ethylene dichloride is a popular solvent for cellulose acetobutyrate.

TECHNICAL DEVELOPMENTS

Further information on these items may be obtained by writing to U.S.I.

A new corrosion-proofing material is available in liquid and plastic forms for application to metal or ceramic surfaces. It is said to provide protection against dilute or concentrated acids or alkalis up to 300° F. Uses suggested by the maker include storage and process equipment, plating tanks, and fume ducts. **(No. 580)**

U S I

A new dyeing process is described as applicable to the coloring of transparent and translucent white plastics. Any color other than pure black or white can be imparted. Process is said to leave the work with a finish equal to that of the pieces before processing. **(No. 581)**

U S I

Beeswax substitutes are available in two grades, one very light in color and the other medium yellow. Chemical analyses and other tests are said to show that the substitutes have properties very similar to imported beeswax, and can be used in many applications. **(No. 582)**

U S I

Electrically conducting rubber is now available in the form of shoe soles and heels for workers in plants where there are explosion hazards. The conductive rubber helps reduce the danger of static electricity, and is also available for such applications as table tops, hose, and conveyor and power transmission belting, according to the maker. **(No. 583)**

U S I

A highly porous form of silica is now available in commercial quantities, particularly for war paint applications. It is said to be useful as a suspending agent to effect soft settling in zinc chromate primers; as a flatting agent in lusterless metal finishes and airplane dopes; for prevention of pigment floating; and for control of viscosity and flow. **(No. 584)**

U S I

pH determinations can be quickly carried out by using a new buffer set in connection with pH test paper, it is claimed. 17 buffer tablets provide basis for solutions of known pH value, which are used to bring out on the test paper the paper's color for any pH value. **(No. 585)**

U S I

A tung oil substitute is reported to make possible the production of satisfactory wrinkle finishes without the use of tung oil. The substitute is described as having a linseed oil base. **(No. 586)**

U S I

Sperm and coconut oils can be satisfactorily replaced in the leather tanning industry by recently developed substitutes, it is reported. The sperm oil subsitute is described as superior in many respects, while the coconut oil substitute has the necessary non-oxidizing qualities.

U S I **(No. 587)**

A rubber extender can be used to replace from 5 to 20% of crude rubber or reclaim in all types of compounds without sacrifice of physical properties, it has been announced. **(No. 588)**

U S I

Blacking out and shatterproofing of windows can be obtained with a new coating, which is said to make windows opaque for periods of a year or more, and also to provide protection from flying glass. **(No. 589)**

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND STREET, NEW YORK — BRANCHES IN ALL PRINCIPAL CITIES

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Amyl Phthalate
Butyl Phthalate
Ethyl Phthalate

OTHER ESTERS
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Ethyl Carbonate
Ethyl Chloroformate
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Acetoacet-ortho-anisidide
Acetoacet-ortho-chloranilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloranilide
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Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

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Ethyl Ether
Ethyl Ether Absolute—A.C.S.
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Urethan
*Vacatone

*Registered Trade Mark

THE OUTLINE OF THINGS TO COME

IN the outline of things to come, Duriron products are playing an important part.

Tanks, airplanes and ammunition are not made of Duriron, but Duriron equipment is helping to pickle the steels of which they are made . . . and to manufacture the acids which are used for pickling.

Duriron pumps are handling the highly corrosive nitric acid with which explosives are made. Duriron equipment is vital in refining tungsten, vanadium, and molybdenum; the precious components of alloy steels.

In converting crude oil to motor fuel and lubricants; in making synthetic rubber for tank treads, tires and insulation, Duriron products have an important war-time job.

And when peace comes, these same Duriron products will continue to serve Industry in developing and promoting its chemical frontiers. New products, new alloys, new plastics, new textiles . . . of these our new world will be built.

As specialists in the design and manufacture of acid-handling equipment for 28 major industries, our engineers and technical men have available for you valuable data on the most modern equipment and alloys for combating corrosion. Their helpful cooperation is yours for the asking.

THE DURIRON CO., INC. **DAYTON, OHIO**

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CORROSION-RESISTING
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3 CHLORINATED ORGANIC CHEMICALS

developed by

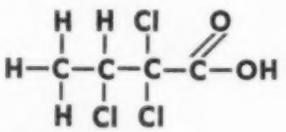
PENN SALT RESEARCH

Hand in hand with manufacturing, Penn Salt carries on unremitting research . . . seeking new compounds, improvements in present products and better production methods.

Now from our Research Laboratories come three chlorinated organic chemicals with interesting properties and possibilities. One or more of them may aid you in replacing restricted essential materials, help you in developing new products, or suggest important changes in your present processes.

2, 2, 3, TRICHLOROBUTYRIC ACID*

$CH_3 \cdot CHCl \cdot CCl_2 \cdot COOH$



PHYSICAL PROPERTIES:

Appearance—white crystalline solid.
Molecular Weight—191.5.
Melting Point—60° C.
Boiling Point—236° C. with only slight decomposition at the boiling point.
Hygroscopic.
A slightly stronger acid than trichloroacetic acid.
Mild odor.
Soluble in water.
Soluble in organic solvents.

*Available as a white crystalline solid, in 60% aqueous solution, or in other strengths.

SUGGESTED USES:

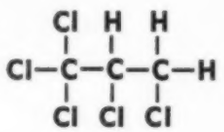
Its similarity to trichloroacetic acid suggests its application where a rather strong organic acid is needed. It appears to have possibilities as a tanning assistant. As an intermediate, it enters into the usual acid reactions forming salts and esters, and in addition it contains reactive halogens greatly increasing its value for the synthesis of further useful compounds.

A full series of aliphatic and other esters have been prepared in our Research Laboratories and are available in research quantities.

Many of these esters are characterized by a fine odor which suggests the possible use of the lower members of the series in soaps, perfumes, and other articles in which fragrance is desirable. The higher aliphatic and polyhydric alcohol esters such as the glycol esters, on the other hand, being practically without odor, but of high viscosity, are potential plasticizers. Formulators will be interested in the penetrant and solvent properties of many of these new materials. Leather, textiles, and paper are a few of the fields suggested for possible use.

1, 1, 1, 2, 3, PENTACHLOROPROPANE

$CCl_3 \cdot CHCl \cdot CH_2Cl$



PHYSICAL PROPERTIES:

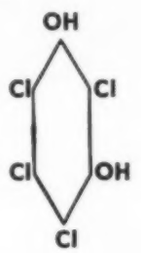
White crystalline solid.
Melting not lower than 178° C. for pure grade, 140° C. for technical grade.
Sublimes.
Has odor of camphor.
Soluble in organic solvents.
Insoluble in water.

SUGGESTED USES:

Its odor suggests its use as an insect repellent. Its compatibility with nitrocellulose and other plastics indicates possible plasticizer value. As an intermediate, it can be dehalogenated, dehydrohalogenated, and enter into other organic halide reactions, producing additional interesting compounds.

TETRACHLORORESORCINOL

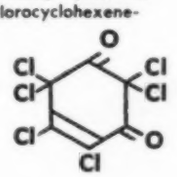
$C_6Cl_4(OH)_2$



PHYSICAL PROPERTIES:

White crystalline solid.
Melting point—141° C.
Faint pleasantly phenolic odor.
Soluble in organic liquids, hot water or dilute alkali—sparingly soluble in cold water.

CHEMICALLY, it is a mild reducing agent, and with chlorine yields* hexachlorocyclohexene-1-dione, 3-5, a quinone of interesting possibilities:



*Beilstein, Vol. VI page 820

SUGGESTED USES:

Condensation of this resorcinol for the preparation of eosin-type derivatives should lead to a series of compounds of possible dyestuff interest. Its antiseptic use is indicated as of probable practical value. In these days of need for phenolics, this compound will probably receive careful evaluation as to uses.

We shall be glad to send samples for investigation and to cooperate with you in working out applications. Probable prices of commercial quantities, when available, supplied on request. Write Dept. CME.

PENNSYLVANIA SALT MANUFACTURING COMPANY

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HERE'S QUICKER DRYING FOR YOU

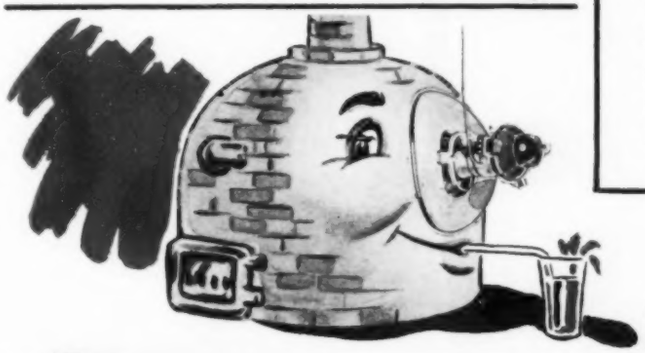
Put a Coppus Blower to work on those sheets you've just treated with coating material. It will dry them quickly — save a lot of time for you. Ideal for drying processes involving paints, lacquers, lumber, brick, pottery, enameling, etc. You'll know by the "Blue Ribbon" this blower is precision-engineered for dependable service.

COPPUS

DOES HEAT MAKE THEM "TEN-PERCENTERS?"

Working in a temperature of 110° F., men are only 10% efficient. Installing Coppus Heat Killers solves this problem. They pour a constant stream of invigorating air on the workers in a hot place — give them "pep" enough to keep working without heat-exhaustion. The Coppus "Blue Ribbon" means this blower is built *to last* — and gives no trouble.

COPPUS



COOL OFF WITH A COPPUS

Coppus Boiler Manhole Blowers and Exhausters save time cooling off and ventilating boilers, furnaces, kilns, retorts, cracking stills, coke ovens, etc. Easily hooked up by one person. The blue band (The Coppus "Blue Ribbon") means extra years of service.

COPPUS

1001 USES

Two general types of Coppus Blowers and Exhausters — one for high velocities of air, the other for large volumes — have been modified many times for special purposes. Check off the applications which fit your needs, and have us send you specific information and prices.

PLEASE SEND ME INFORMATION ON

Supplying Fresh Air to Men Working:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ around cracking stills.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ supplying fresh air to storage tanks on tank farms.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

(Write below any special ventilating problem you may have.)

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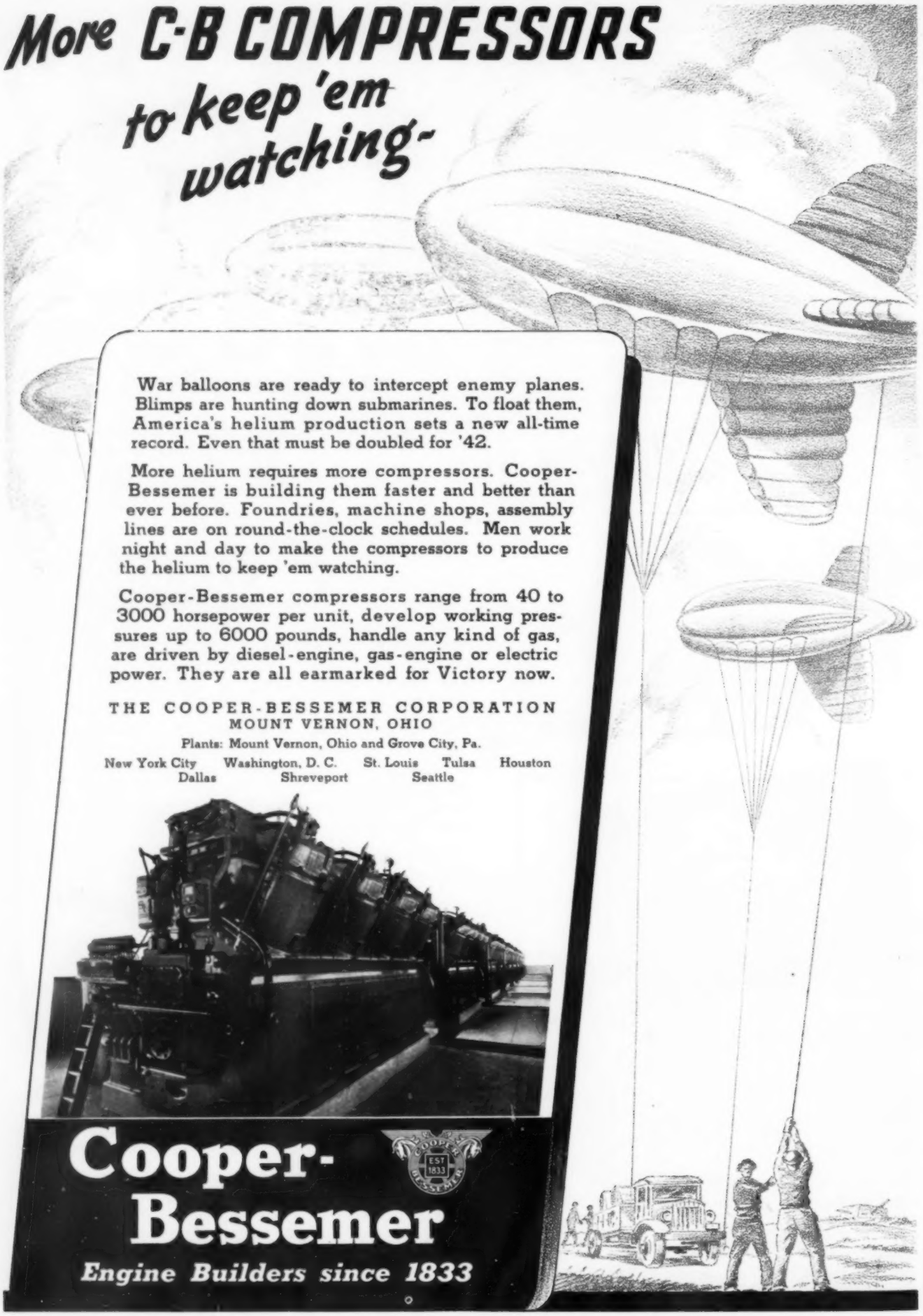
MAIL THIS COUPON

To Coppus Engineering Corp., 266 Park Avenue, Worcester, Mass. Sales offices listed in THOMAS' REGISTER. Other "Blue Ribbon" Products in SWEET'S and CHEMICAL ENGINEERING.

COPPUS "BLUE RIBBON" BLOWERS AND EXHAUSTERS

DESIGNED FOR YOUR INDUSTRY ... ENGINEERED FOR YOU

More C-B COMPRESSORS to keep 'em watching-



War balloons are ready to intercept enemy planes. Blimps are hunting down submarines. To float them, America's helium production sets a new all-time record. Even that must be doubled for '42.

More helium requires more compressors. Cooper-Bessemer is building them faster and better than ever before. Foundries, machine shops, assembly lines are on round-the-clock schedules. Men work night and day to make the compressors to produce the helium to keep 'em watching.

Cooper-Bessemer compressors range from 40 to 3000 horsepower per unit, develop working pressures up to 6000 pounds, handle any kind of gas, are driven by diesel-engine, gas-engine or electric power. They are all earmarked for Victory now.

THE COOPER-BESSEMER CORPORATION
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Cooper-Bessemer

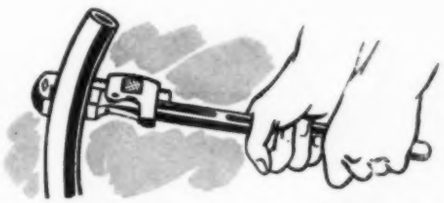
Engine Builders since 1833

GET MORE USEFUL HOURS

FROM YOUR PIPE WRENCH

These few suggestions on what to do and what not to do when using a pipe wrench may help to assure the long life that pipe wrenches possess when fairly treated. As manufacturers of the original and genuine Stillson, as well as of the newly improved Walco Pipe Wrench, we offer this advice:

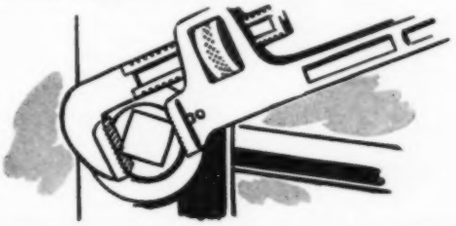
Do not put extended leverage on the wrench handle. The extra load will strain the wrench excessively. Shorter life results.



Do not subject the pipe wrench to side strains. Even the strongest pipe wrench will suffer from this wrong usage.

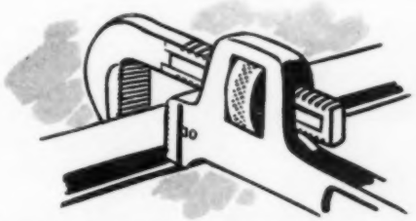
Do not use a pipe wrench in place of a hammer. It is not designed to withstand impact and shock. Use a hammer.

(Incidentally, don't smash fittings. Metal's too precious today.)



Do not apply pipe wrenches on hardened steel objects such as set screws, etc. Such practice causes undue wear on the teeth.

Keep teeth clean. Give them a chance to grip firmly. Dirty teeth cause slipping. Slipping causes wear and, perhaps, accidents.



Do not grip pipe too near the front or too far back in the jaws of the wrench. Careless application causes slipping and wear.

THE "GENUINE STILLSON," "WALCO" AND "PARMELEE" PIPE WRENCHES ARE MADE BY THE MANUFACTURERS OF WALWORTH VALVES AND FITTINGS

WALWORTH 1842 1942 VALVES AND FITTINGS 100TH. ANNIVERSARY

Walworth, the oldest manufacturer of valves and fittings in the United States, scrapped its "institutional" ads planned for its 100th Anniversary in order to present these educational messages in a sincere effort to help users of Walworth products get maximum service.

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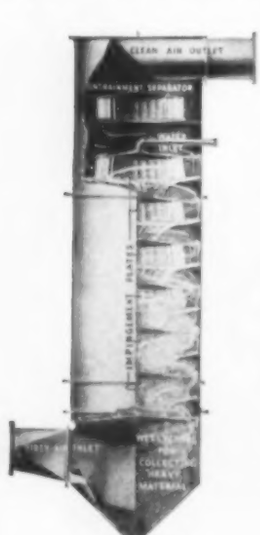
AN ENEMY OF INDUSTRY–H_2S–IS ELIMINATED!

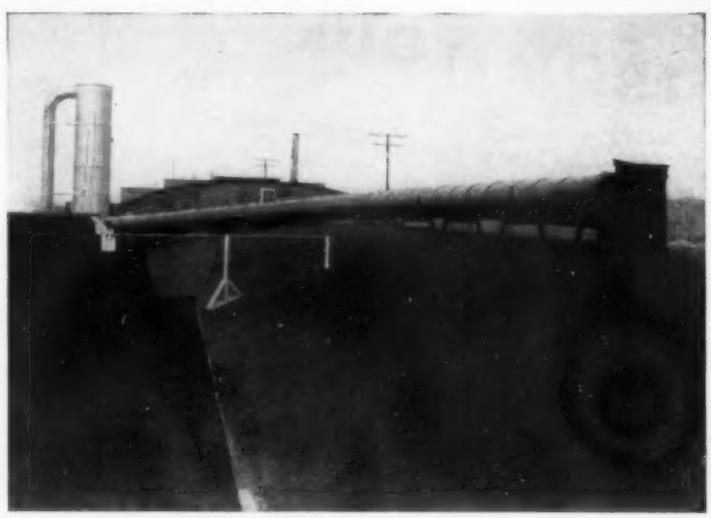
With American factories working full blast on war orders, elimination of unhealthy dust and obnoxious fumes is vitally important. Clean, washed air in process plants means clear heads when Uncle Sam needs them most.

A Schneible Multi-Wash Dust Collector system safeguards employees' health, protects plant equipment, prevents waste of volatile materials, recovers valuable products, salvaging by-products lost in dust or fumes. No bags, screens or filters—no moving parts—nothing to wear, break or burn—nothing to clog or freeze — nothing to maintain — only water or some other cleansing liquid at no head pressure used over and over.

A 12,000 c.f.m. Special Multi-Wash Collector in a large Madison, Wisc. processing plant, has for more than a year been effectively removing hydrogen sulphide, ammonia and other obnoxious fumes exhausted in manufacturing a specialized viscose product, abating what was formerly a neighborhood nuisance.



If you manufacture a chemically processed product, write us describing your dust and fume problem. Our engineers will gladly help you.



CLAUDE B. SCHNEIBLE COMPANY
3953 Lawrence Ave., Chicago
Offices in Principal Cities

SCHNEIBLE

LET'S GET DOWN TO DETAILS

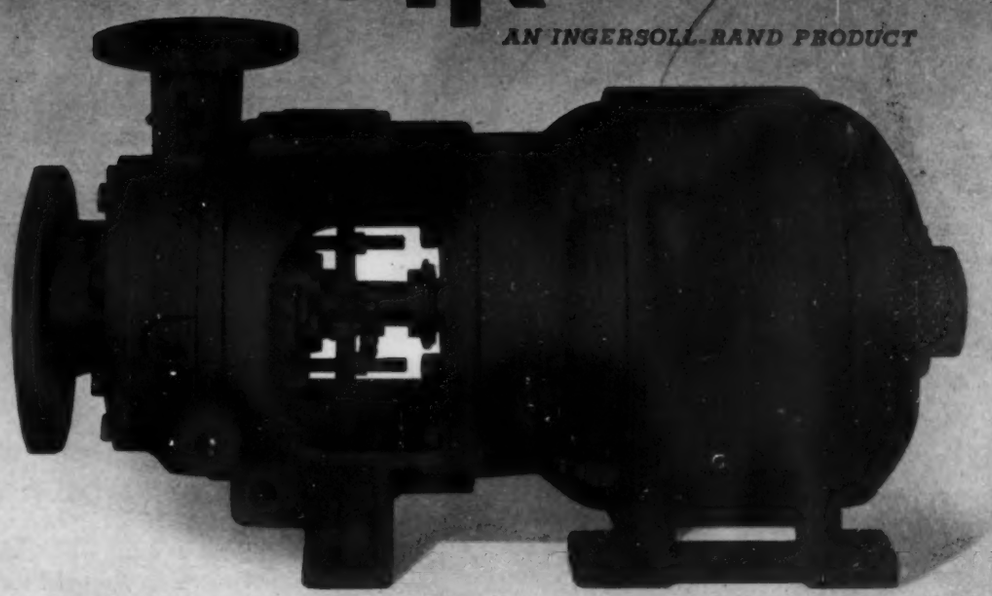
THE CAMERON

MOTORPUMP

AN INGERSOLL-RAND PRODUCT

Design and construction details in a pump are of the utmost importance. Upon them depend pump efficiency, length of service, freedom from trouble and ease of maintenance.

Careful attention to details has in a large measure been responsible for the outstanding success of the Ingersoll-Rand Motorpump. Some of these details are show below. Let our engineers discuss the Motorpump with you. Capacities 5 to 1800 gpm; heads to 500 feet.



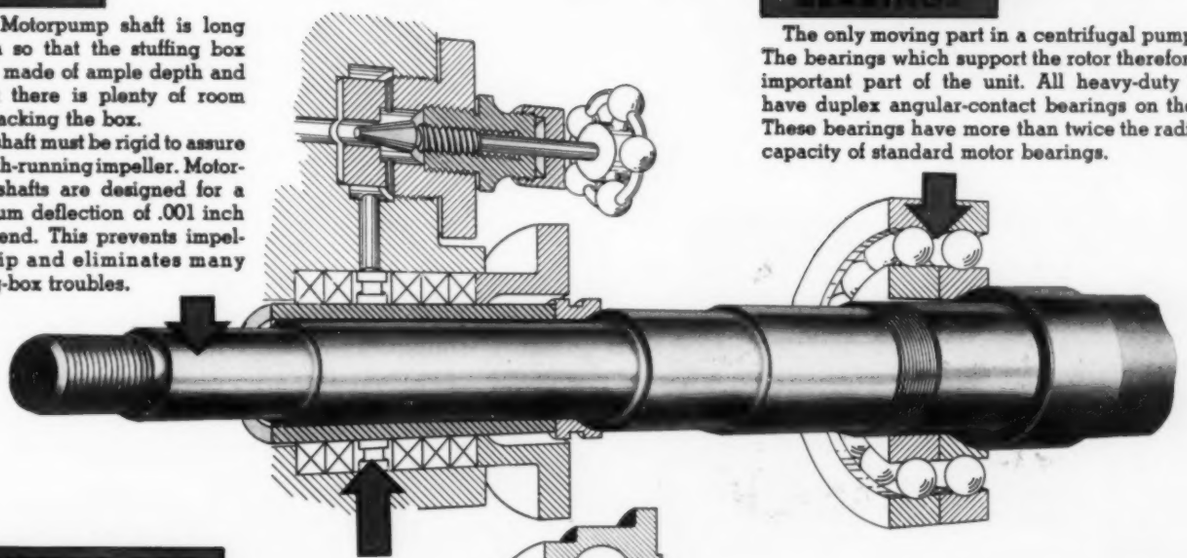
SHAFT

The Motorpump shaft is long enough so that the stuffing box can be made of ample depth and so that there is plenty of room for repacking the box.

The shaft must be rigid to assure a smooth-running impeller. Motorpump shafts are designed for a maximum deflection of .001 inch at the end. This prevents impeller whip and eliminates many stuffing-box troubles.

BEARINGS

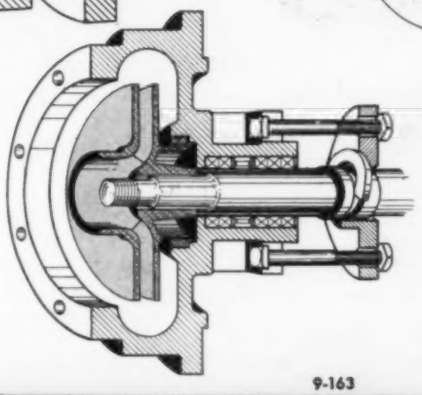
The only moving part in a centrifugal pump is the rotor. The bearings which support the rotor therefore, are a most important part of the unit. All heavy-duty Motorpumps have duplex angular-contact bearings on the pump end. These bearings have more than twice the radial and thrust capacity of standard motor bearings.



STUFFING BOX

The stuffing box on the Motorpump holds sufficient packing to permit accurate control of the sealing action. In addition a sealing gland is placed in the box, except for liquids requiring special packing. When the pump handles water the liquid for this gland is taken from the casing. Its flow is controlled by a needle valve. External seals are provided when handling liquids which can not be used in the sealing gland.

There is ample room to repack the stuffing box, and a convenient split gland is provided.



IMPELLER PULLER

In order to facilitate the removal of the impeller, and shaft sleeve, a patented impeller puller is incorporated on heavy-duty Motorpumps.

This consists of a slotted sleeve on the shaft in which a yoke may be inserted. When the suction nozzle and impeller nut are removed, the impeller can easily be pushed off by tightening the stuffing-box gland against this yoke.

9-163

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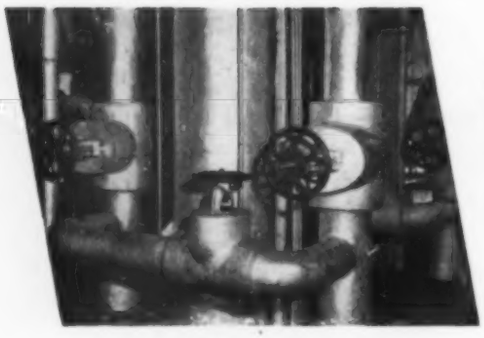
They're Using the { *ECONOMICAL* / *EFFICIENT* / *EASY-TO-USE* } *insulation:* **unibestos**



unibestos pipe insulation is providing greater flexibility and ease of application (sectional construction in standard sizes up to 36"); lighter weight and greater structural strength; higher thermal efficiency and the economy of reapplication for production-minded plants throughout the country

unibestos is the economy, as well as efficiency, insulation—Standard and Super material is available in single layer construction. Unibestos can be applied and reapplied over and over again—and it won't shake-down, calcinate or shatter even under the most severe conditions.

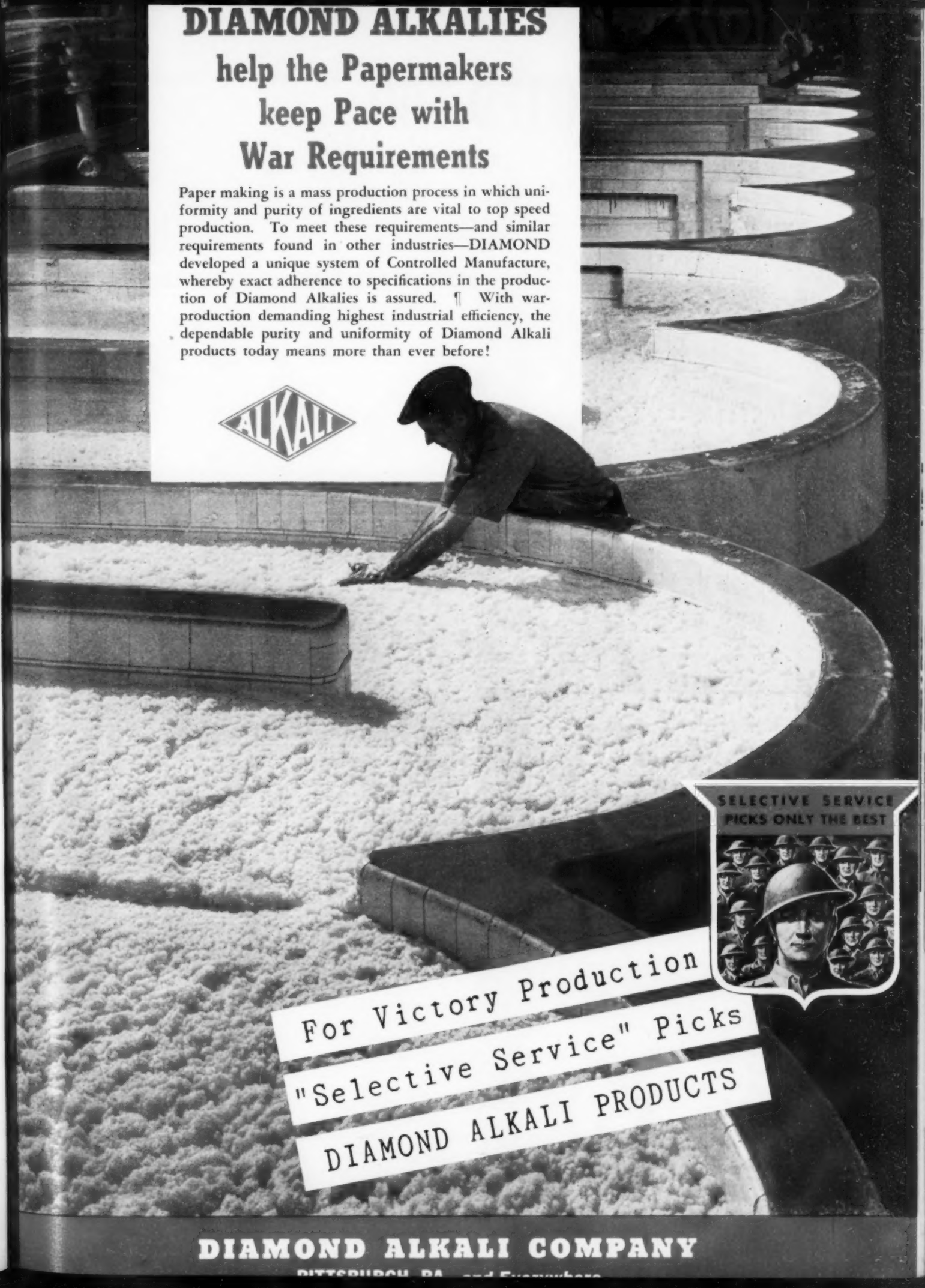
unibestos takes paint readily—presents an attractive finished appearance . . . the hard, smooth surface requires no further protection or finish. Unibestos provides a clean-cut insulating job—it saws or cuts easily with ordinary tools and it's easy to strip off layers to fit unions, flanges, etc.

unibestos provides higher insulating efficiency and greater economy. For greater structural strength, higher thermal efficiency, flexibility and ease of application—use Unibestos—the Amosite asbestos insulation!

UNION ASBESTOS AND RUBBER CO.
1821 SOUTH 54TH AVENUE, CICERO, ILLINOIS

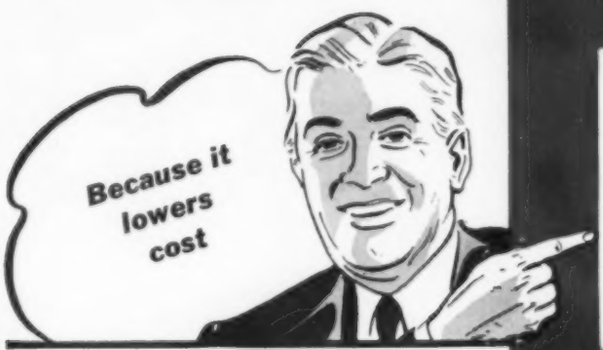
UNARCO

unibestos: CONSERVES THE VITAMINS OF INDUSTRY . . . THE **B.T.U.**


DIAMOND ALKALIES
help the Papermakers
keep Pace with
War Requirements
Paper making is a mass production process in which uniformity and purity of ingredients are vital to top speed production. To meet these requirements—and similar requirements found in other industries—DIAMOND developed a unique system of Controlled Manufacture, whereby exact adherence to specifications in the production of Diamond Alkalies is assured. ¶ With war-production demanding highest industrial efficiency, the dependable purity and uniformity of Diamond Alkali products today means more than ever before!
ALKALI
SELECTIVE SERVICE PICKS ONLY THE BEST
For Victory Production
"Selective Service" Picks
DIAMOND ALKALI PRODUCTS
DIAMOND ALKALI COMPANY

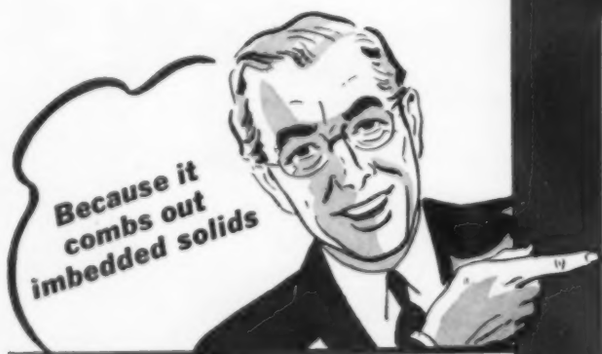
EACH ONE VOTED FOR CUNO

SERVICE	REQUIREMENTS	VIBRATING SCREEN	CUNO AUTO-KLEAN
Removal of foreign solids from paper coating and break up of pigment particles	Low maintenance cost on severe service	Needs constant attention	Cleans itself continuously. No attention required except for periodic sludge blow-off



SERVICE	REQUIREMENTS	OTHER BACKWASH FILTERS	CUNO FLO-KLEAN
Straining 10,560 g.p.m. of process water	Efficiency and low cost	Backwash discharged to atmosphere	No loss of backwash fluid. Substantial savings in pumping costs

SERVICE	REQUIREMENTS	DUPLEX STRAINERS	CUNO AUTO-KLEAN
Straining of rayon spinning dope (700,000 SSU) to remove undesirable solids	Uninterrupted flow	Cleanable without stopping flow	Cleanable without stopping flow
	Small space	Double space required	Single compact filter used
	Dope cannot be exposed to air	Inoperative half must be opened for cleaning	Unnecessary to open filter for cleaning



SERVICE	REQUIREMENTS	WIRE-WOUND FILTER*	CUNO AUTO-KLEAN
Removal of lumps and dirt from glues and pastes	Complete positive cleaning	Scraper blade fails to clean imbedded solids	Cleaner blades remove not only solids adhering to cartridge surface but also those imbedded in filter medium. (See diagram)
	Must remove lint continuously	Not effective against lint	Removes lint continuously

*Both Cuno wire-wound type and competitive make were considered.

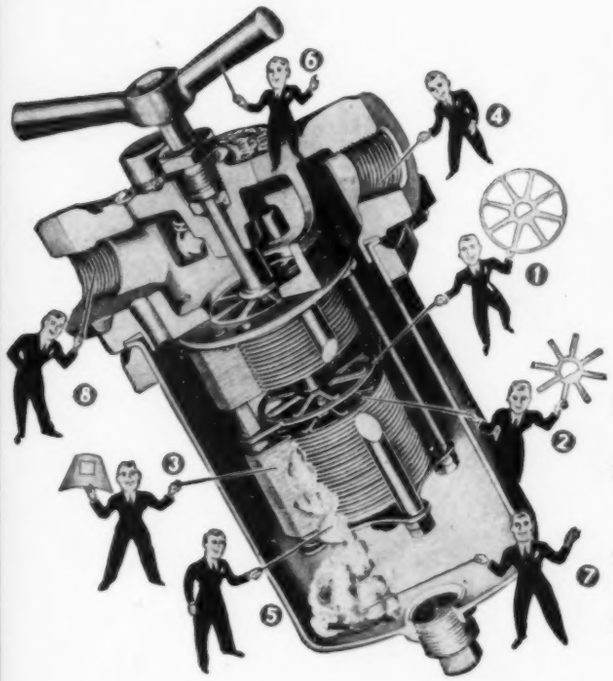
Have You a DIFFERENT Fluid-Cleaning Problem?

Then you will probably find your answer in this list of Cuno features. And look for other Cuno ads—each one describes four services for which Cuno "Filter-Fine" Strainers have been selected over other fluid-cleaning methods.

CUNO AUTO-KLEAN FILTER

1. Cleanable (manually or automatically) without interrupting fluid flow.
2. Non-collapsible, all-metal construction.
3. Minimum pressure drop.
4. Permanent filter element — no cartridge to replace.
5. Obviates duplex installation.
6. Cleaned by *combing*, not scraping.
7. Minimum filter maintenance.

Made of any machinable metal in a wide range of sizes — small compact units up to massive motor-driven models — to handle fluid, air, gas.



NO STOPS FOR CLEANING FLUID
NO STOPS FOR CLEANING FILTER

1. Wheel-shaped discs are stacked on a central rotatable shaft.
2. Discs are held apart by spacers conforming in shape to discs but without rim.
3. Cleaner blades stacked on stationary rod extend into slots between discs.
4. Fluid containing solids enters casing here . . . must pass between discs.
5. Solids larger than space between discs are retained on outer edges.
6. Turning handle by hand or motor causes discs to rotate past stationary cleaner blades.
7. Rejected solids fall to bottom of sump . . . drained when convenient.
8. Filtered fluid passes out here.

If Your Service Is Like One of These . . . And Foreign Solids Are a Problem . . . Cuno Is the Answer

Acids
Adhesives
Air
Alcohol
Alkali
Ammonia
Animal Oils
Asphalt
Banana Pulp
Beer
Beverages
Casein
Castor Oil
Caustic
Cellulose
Cement
Chocolate
Coatings
Coolants
Dope
Enamels
Extracts
Flavors
Fuel Oil
Gases
Gasoline
Glue
Grease
Gum
Hydrogenated Oil
Ink
Lacquers
Latex
Molasses
Paint
Palm Oil
Paraffine
Paste
Pyroxylin
Resins
Rubber Cement
Sizing
Soap
Solvents
Syrups
Tar
Tooth Paste
Vegetable Oils
Water
Wax

KEEP FLOW ON "GO" WITH

CUNO

THE "FILTER-FINE" STRAINER

There are many Cuno models . . . this FREE booklet describes them. Send coupon.

CUNO ENGINEERING CORPORATION
106 South Vine Street, Meriden, Conn.

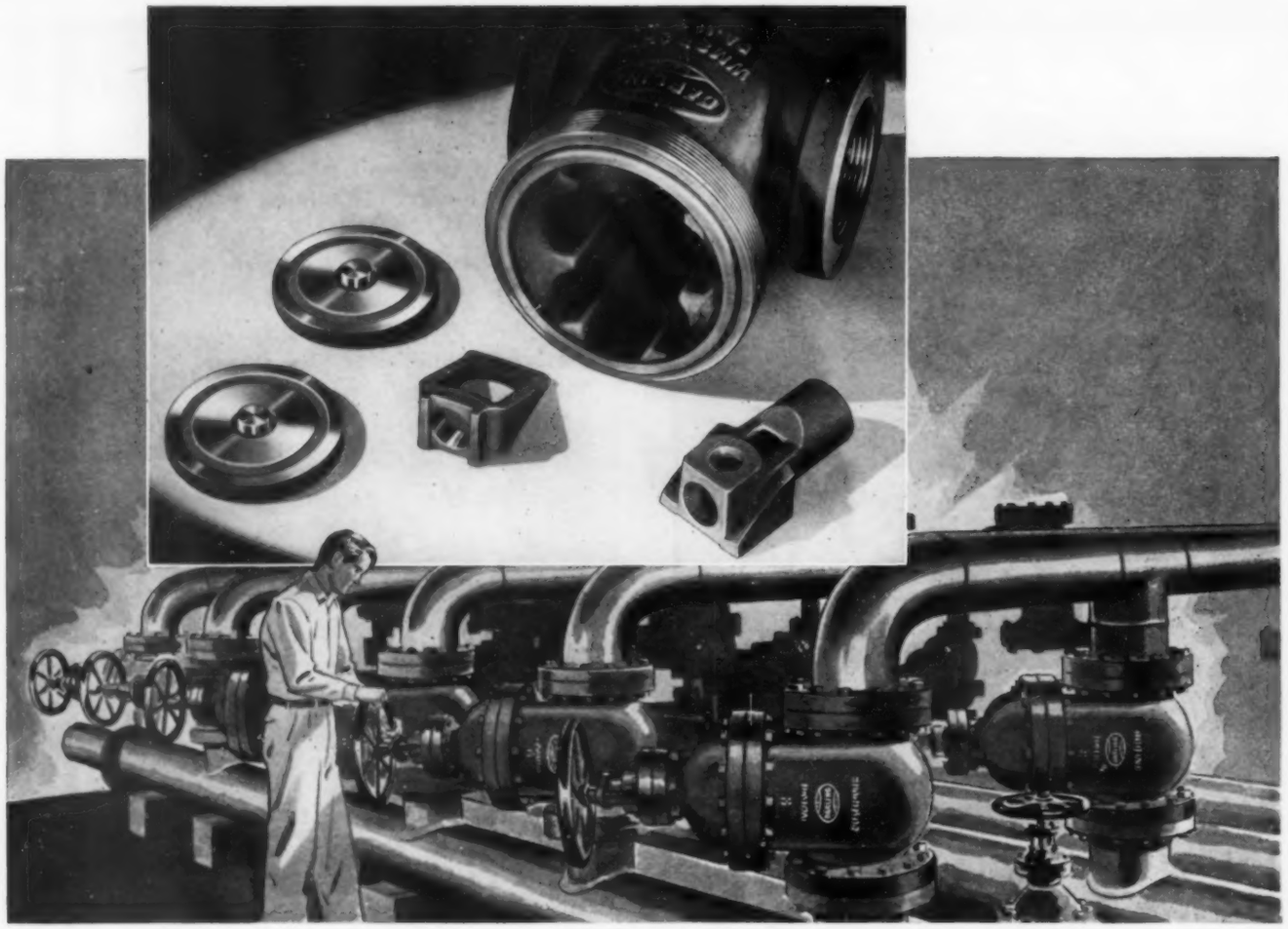
Please send free copy of "Quick Facts" to

Name .....

Company .....

Address .....

.....



You write your own DARLING VALVE GUARANTEE

Here are the 4 reasons any Darling Valve will serve you better

● Longer life, better service for you are *designed into* Darling Valves with these 4 simple parts that have stood up under industry's toughest jobs for more than 40 years. The parallel discs are *fully revolving*—they never seat in exactly the same position in any two closings. That means wear is uniform and is distributed evenly over the entire surface of the discs. There is no other valve with this design. Darling gives you what you buy, a valve for *positive seating* over longer service. Men in the service departments of a dozen industries prefer Darling Valves because they last longer, cost less to maintain, cost *least* per gallon delivered per year of use.

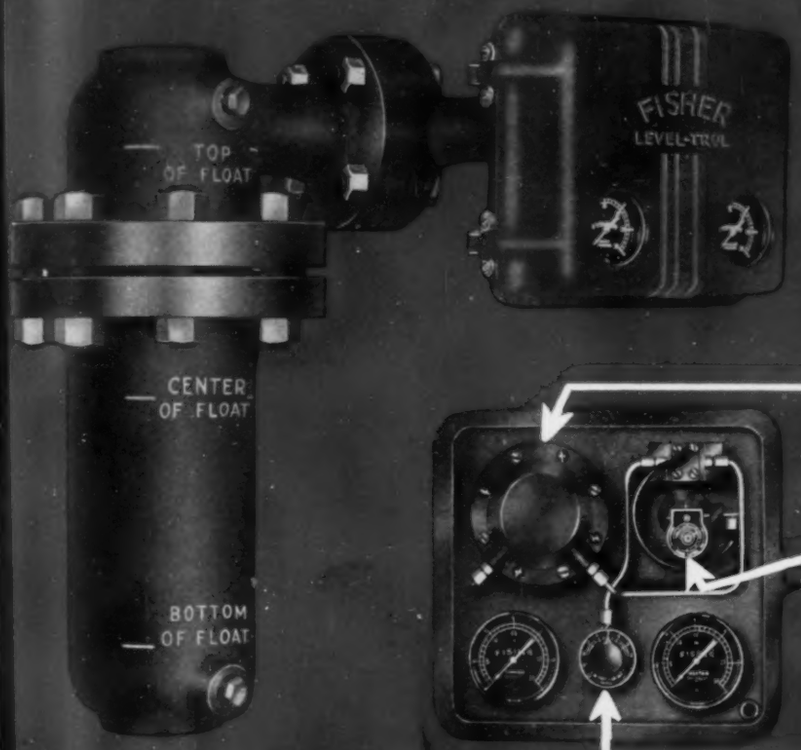
We'll put the right Darling Valve in your toughest control point, and *you* write the guarantee. Call in the Darling Valve & Manufacturing Co., Williamsport, Pa.

Darling offers you a quality line of longer-lasting Gate Valves. They come in Fully Revolving Parallel Seat Double Disc, also in Taper Seat—Slotted and Solid Wedge types. In service pressures up to 3000 pounds, you can get Darling Gate Valves in Cast Iron, Bronze, Forged Steel, Cast Steel, and Corrosion Resistant Alloys. Darling also manufactures Compression Type Fire Hydrants, Check Valves, Motor and Cylinder Operated Valves, and many accessories.

TRADE DARLING MARK

VALVE & MANUFACTURING CO.
WILLIAMSPORT, PA.

FISHER ANNOUNCES an Improved DISPLACEMENT TYPE LEVEL-TROL



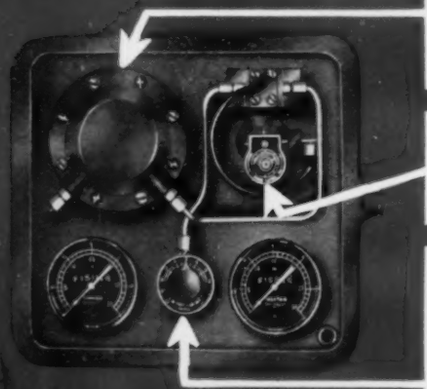
Type 2400-248 LEVEL-TROL with 500 lb. cast steel float cage screwed equalizing connections — 14" float.

FEATURING

Greater Sensitivity . . . Speed of Action . . . Freedom from Service Trouble . . . Ease of Adjustment

Available in Float Cage or Internal Float Type Construction for Handling all Liquids, at all Pressures, Temperatures, Specific Gravities.

EXTREME SENSITIVITY . . Accurately engineered to insure extremely sensitive level control — No measurable lag. Pilot is 100% pneumatic in operation — All linkage, pivot points and other sources of friction eliminated. Necessary operating power reduced to an absolute minimum.

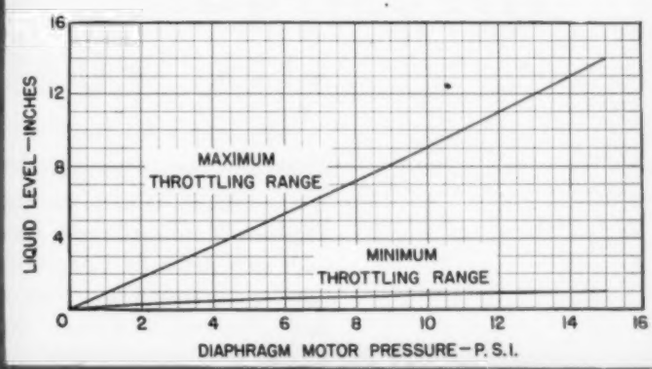


Pilot Relay Speeds Action of Diaphragm Valve in Response to Level Change. Intermittent bleed relay, greatly magnifies pressure and volume of air passing through primary orifice system. Response of diaphragm valve to level change is extremely rapid.

Level Position Adjustment Permits Operator to Control Level at Any Desired Point within Length of Float. Adjustment is easily made by turning the knob in accordance with the arrow on adjustment dial.

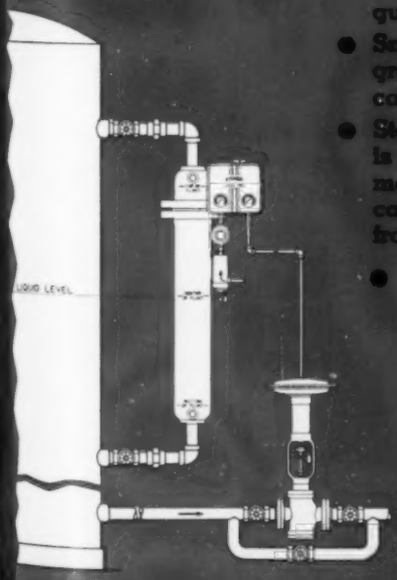
Throttling Range Adjustment Makes Level-Trol Suitable for Wide Variety of Applications. Makes it possible to vary amount of level change necessary to fully stroke diaphragm valve. Minimum level change may be as little as ½" and the maximum equal to length of float. Adjustment knob provided with calibrated dial — easily operated — readily accessible.

Straight Line Action . . Curves, below, illustrate how pressure changes on diaphragm as level changes throttling range setting in the two extreme positions.



New Design Features

- Inconel torque tube construction eliminates stuffing box packing, and lubricator—is supported by stainless steel knife edge bearing, free from gumming and sticking.
- Small rotary shaft turns on precision ground ball bearing inside the pilot case.
- Stainless or plated carbon steel float is freely suspended, free from lost motion and entirely free from friction causing guides. Available in lengths from 14" to 120"
- High-tensile iron and steel cages for pressures 125 lbs. to 2500 lbs. A.S.A. ratings, are furnished with 1½" and 2" screwed equalizing connections or with 2" flanged connections.



Typical Level-Trol installation for maintaining liquid level by controlling flow from the vessel.

FIVE LEVEL-TROL TYPES

Fisher Level-Trols are available in two float cage types and three internal float types for flange mounting on top or side of vessel with float sizes to meet all service conditions. All types can be furnished for pressures 125 lbs. to 2500 lbs., A.S.A. Ratings.

Write for New Descriptive Bulletin F-1.

Other Level-Trol Pilot Features

REVERSIBILITY . . Pilots may be either reverse or direct acting as specified or can be easily reversed in the field.

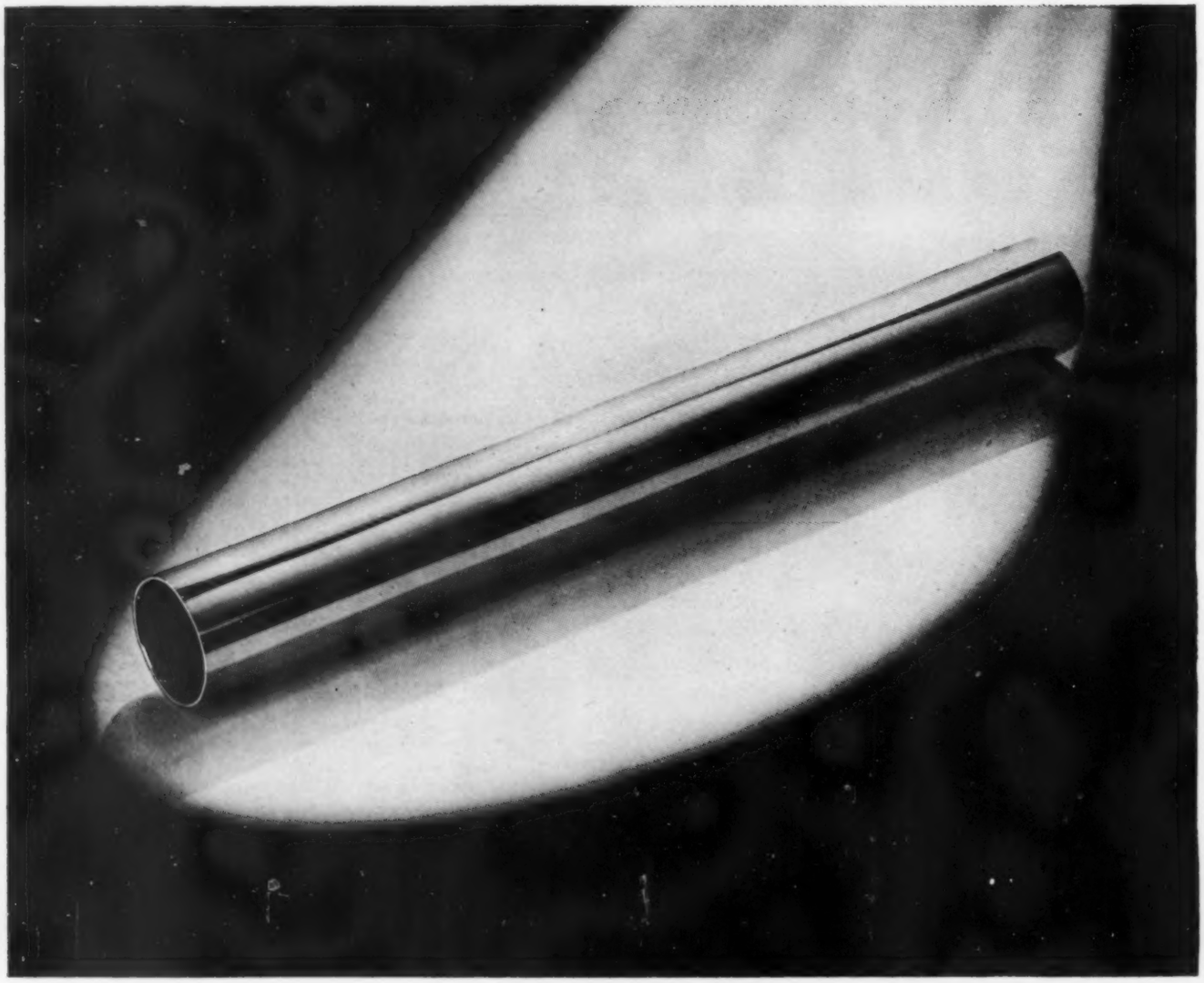
BLEED . . Screened elbow fitting is provided for bleed vent. Bleed may also be piped away if desired.

CASE . . High-tensile iron pilot case is weather proof and gas tight. The hinged door is gasket sealed. Supply and diaphragm pressure tappings are screened.

INSTRUCTION PLATE . . Metal instruction plate, on inside of pilot door gives service ratings of cage, dimensions and collapsing pressure of float, and adjustment instructions.

AUXILIARY PARTS . . All Level-Trols furnished with operating medium regulator and filter.

FISHER GOVERNOR COMPANY
• 1808 FISHER BUILDING •
MARSHALLTOWN, IOWA



Investigate "GLOWELD"... THE NEW

GLOBE WELDED STAINLESS STEEL TUBING

... Gloweld is the result of a long period of research and experiment by the Globe Steel Tubes Co., pioneer manufacturer of stainless steel tubing.

It is produced by a closely controlled electric welding process that gives it unusually smooth finish — "flash" is hardly detectable. Gloweld's light weight, high resistance to corrosion, heat and pressure, comparatively lower cost, and other advantages will find many applications for tubing in chemical and process industries, food industries, pulp and paper, oil and other industries where these factors are needed. It is already in use in aircraft construction — as hydraulic lines, for frame and engine parts. Available in a wide range of diameters and wall sizes, in practically all stainless steel analyses. Write for full information.

GLOBE STEEL TUBES CO • MILWAUKEE, WISCONSIN

GLOBE TUBES

4000

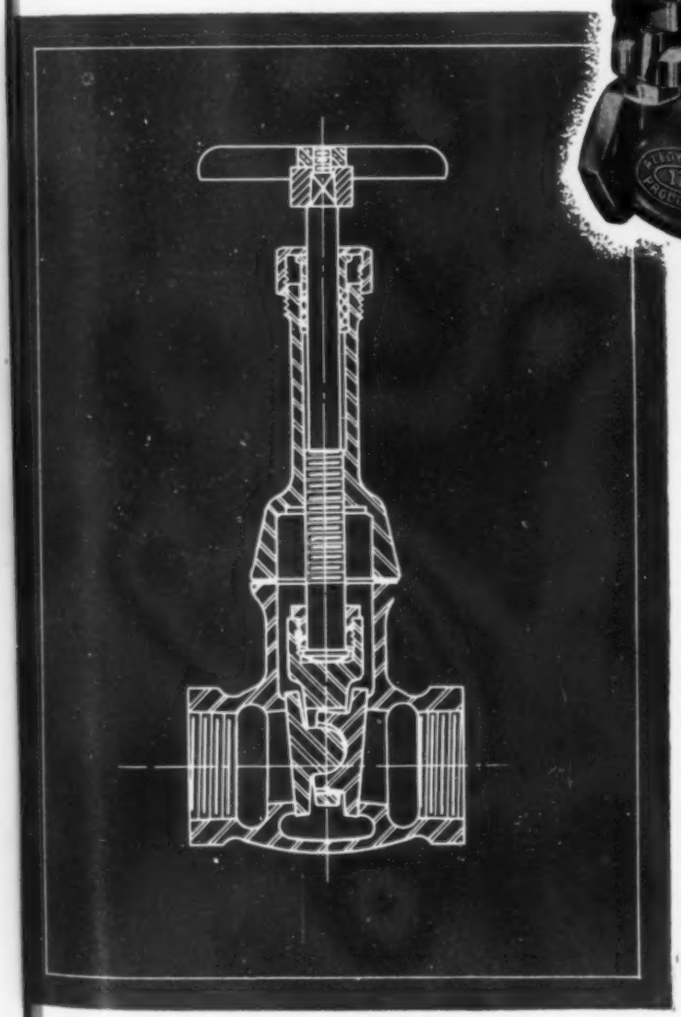
- Stainless Tubes
- Boiler Tubes
- Condenser and Heat Exchanger Tubes
- Mechanical Tubing

GLOBE STEEL TUBES

...resistant to acids, salts and corrosive gases

GLOBE VALVES TANK VALVES
LEVER THROTTLE GATE VALVES
CHECK VALVES SCREWED FITTINGS
GATE VALVES FLANGED FITTINGS
Y VALVES GAUGE GLASS FITTINGS

No. 3 in a series depicting the specific vital advantages responsible for the major role assumed by ALOYCO Stainless Steel products in industry today.



Illustrated is ALOYCO Number 90, Clamp type Gate Valve with Screwed ends. Made in sizes ½" to 2" inclusive in Chrome Nickel 18-8S.

The high physical properties and excellent chemical characteristics of the materials used in the manufacture of ALOYCO Stainless Steel and Corrosion Resisting Valves and Fittings safeguard against oxidation and contamination.

Continuous uninterrupted operation in the Chemical, Process and Food Industries is assured with ALOYCO products—available today on priority ratings.

ALLOY STEEL PRODUCTS COMPANY, INC.
1300 West Elizabeth Avenue Linden, New Jersey

ALOYCO
STAINLESS STEEL VALVES AND FITTINGS

not always

Hard Metals Are Necessary ...when PUMPING HOT CORROSIVE SLURRIES

Corrosion Resistance, plus Toughness, with correct Design, explain the remarkable performance of WORTHITE PUMPS in the handling of many corrosive slurries.

Notice the absence of corrosion or wear on internal parts of this WORTHITE Pump after 27 months pumping hot brine slurry from a salt evaporator. Percent solids ran as high as 40%.

Send for your copy of this instructive bulletin:

This new Bulletin gives many interesting facts about WORTHITE Pumps at Worcester Salt Company.

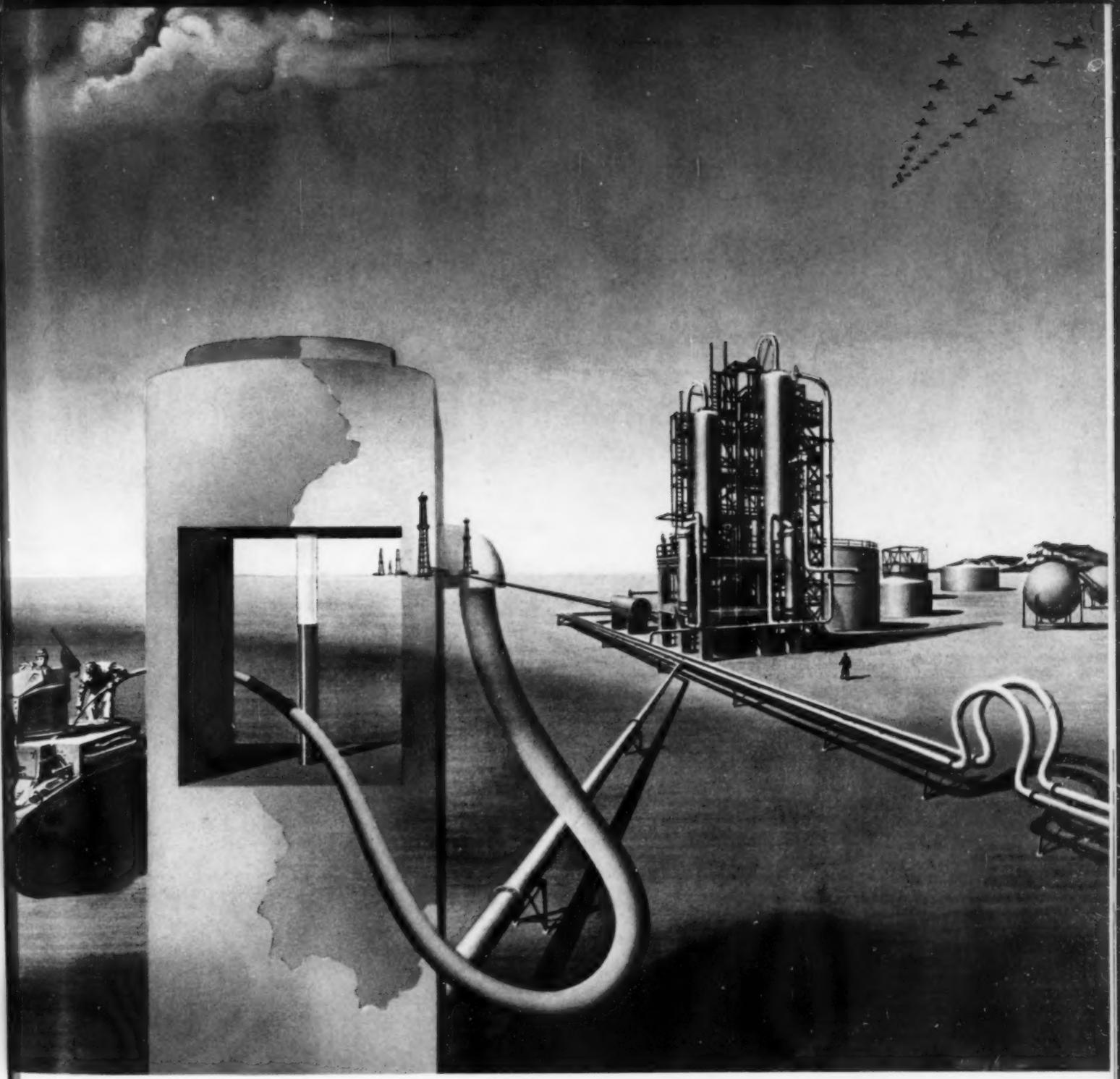
Also records of WORTHITE Pumps handling slurries in other industries such as: Glauber's Salt, Potash, Pigment (Ferrous Sulphate), Ammonium Sulphate.

Bulletin No.
W-350-B6

CP2-2

WORTHINGTON

WORTHINGTON PUMP & MACHINERY CORPORATION • GENERAL OFFICES: HARRISON, N. J.



Victory will be measured in gallons

When you hear, with bated breath, how close the enemy has come to a victory with some raid of fifty or a hundred planes, you may wonder what merciful fate kept them from using a thousand. It was more likely lack of *fuel*, not fate, that stayed them.

To reach more oil, the Axis has been flailing about Europe and Asia like a monster sacrificing lives by the hundreds of thousands.

The American petroleum industry, with half the world's reserves, and a tremendous production of the finest gasolines and oils, is our greatest guarantee of ultimate victory.

For the petroleum industry, Koppers has built plants to remove the corrosive hydrogen sulfide and recover the sulfur in a form that can be readily converted into war-important sulfuric acid.

Koppers produces chemicals to help make gasolines anti-knock; ingredients for the manufacture of inhibitors to prevent gum formation in gasoline; chemicals for solvent refining and dewaxing for the improvement of lubricating oils; chemicals that improve the pour point and film strength of oils.

Among other products which Koppers furnishes to the petroleum industry are piston rings; Fast's self-aligning couplings; pressure treated piling, lumber and timber. In its service to the petroleum industry, Koppers feels that it is helping write the history of the war. Koppers Company, Pittsburgh, Pa.

KOPPERS

THE INDUSTRY THAT SERVES ALL INDUSTRY

BUY UNITED STATES WAR BONDS AND STAMPS

TYGON *geared to the impossible*

OUT-PERFORMS RUBBER FOR MANY VITAL ACID TANK LININGS

TYGON is rapidly replacing rubber as a corrosion resistant material in many process installations and in a majority of cases is doing a better job and doing it more economically.

For Tygon, unlike rubber, does not chemically deteriorate with age. It is not affected by air, sunlight, or oxidizing chemicals. Tygon, unlike rubber, does not swell in oil or water and is unaffected by many solvents. Within the range of its temperature limitations (-15 deg. F to 175 deg. F) Tygon possesses greater resistance to abrasion than rubber.* Unlike rubber, Tygon will burn only when in continuous contact with flame.

Tygon, like rubber, possesses high dielectric strength — of great importance in plating operations where current sometimes plays queer tricks on linings...and unlike rubber, Tygon will handle any plating solution.

Not alone as a replacement for rubber — the use of Tygon is indicated for those installations where the physical qualities of rubber are desirable but where its use is prevented because of its admitted weakness to the attack of certain corrosives. For example, even the best rubber compounds will not handle nitric acid, high concentrations of sulphuric acid or chromic acid. Tygon will handle all three — and, likewise, Tygon is unaffected by any of the reagents which rubber will handle satisfactorily. Tygon, however, is attacked by chlorinated solvents, fuming nitric, glacial acetic acid and certain of the ketones.

** Tygon can be compounded to fit specialized needs with varying physical characteristics as desired. For technical data write Synthetics Division, The United States Stoneware Company, Akron, Ohio*

US STONEWARE

LINED EQUIPMENT • ACID PROOF MASONRY • ALLOY EQUIPMENT • CHEMICAL STONEWARE

WORKS:
AKRON, OHIO

Since 1865

CENTURY
Totally Enclosed Fan Cooled MOTORS

Operate Continuously in

- ***Abnormal Atmospheres***
- ***Acid and Alkali Fumes***
- ***Abrasive Dusts***

To meet the particular requirements of many chemical and processing industries, Century Totally Enclosed Fan Cooled Motors are engineered to provide vital protection against ordinarily destructive atmospheric conditions.

Century TEFC Motors operate continuously under conditions where the air contains mild acid or alkali fumes, metal cuttings, coolant solutions, abnormal quantities of metallic, abrasive, or other destructive dusts.

Where atmospheres are charged with high concentrations of destructive fumes, Century TEFC Motors can be furnished with specially treated insulations.

To avoid production delays caused by these conditions, and to assure continuous, three-shift, economical motor performance — so essential in these days of unprecedented industrial effort — you can rely on Century Type TEFC Motors.

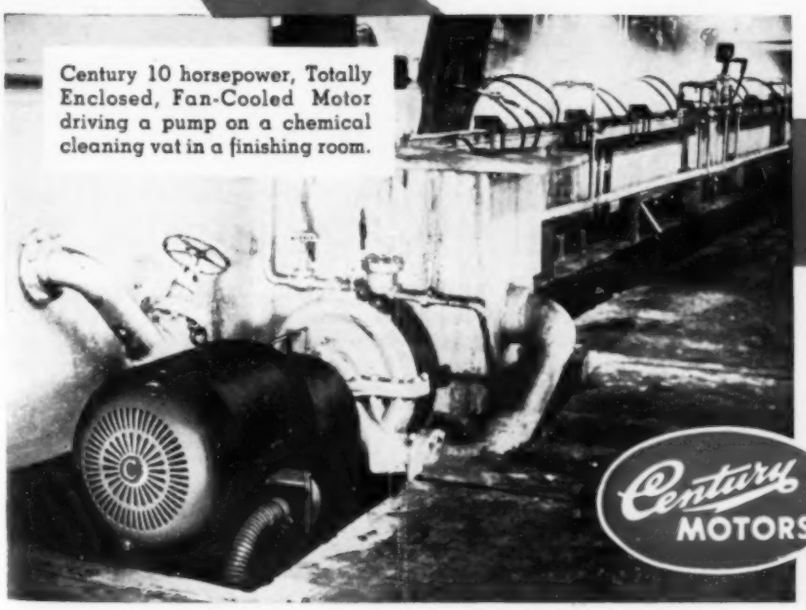
Century offers a wide range of motor types and sizes, from fractional to 400 horsepower, including Splashproof and Explosion Proof designs — each engineered to fit a particular industrial job.

Consult your nearest Century Motor Specialist about any motor drive problem in your plant. His advice may well expedite production, save you money, too.

CENTURY ELECTRIC CO., 1806 Pine Street, St. Louis, Missouri

Offices and Stock Points in Principal Cities

One of the Largest Exclusive Motor and Generator Manufacturers in the World.



Century 10 horsepower, Totally Enclosed, Fan-Cooled Motor driving a pump on a chemical cleaning vat in a finishing room.

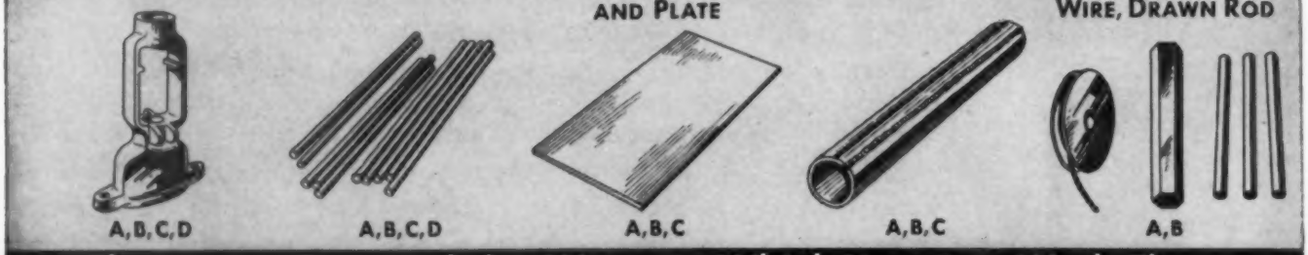
283

Do You Know These Facts About HASTELLOY ALLOYS...

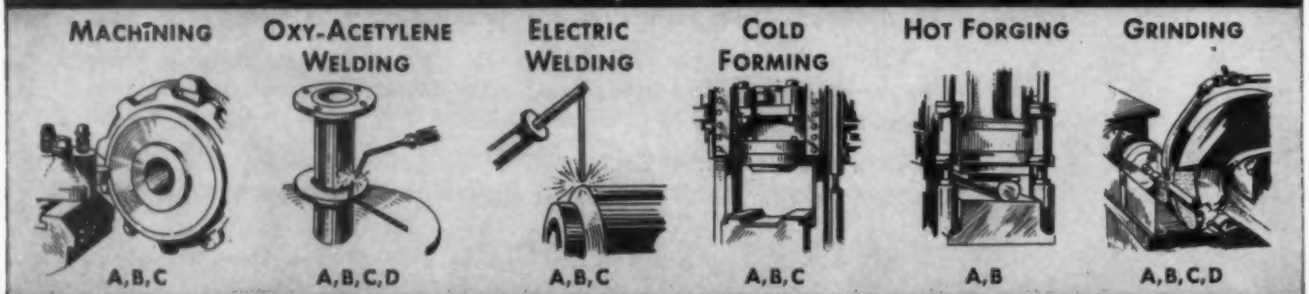
For Resistance To Severely Corrosive Media?

For resistance to severely corrosive media, use one of the four Hastelloy nickel-base alloys — A, B, C, or D. Many types of chemical equipment—such as valves, pumps, pipe and fittings, autoclave liners, heating or cooling coils, agitators, and acid concentrator tubes — are being fabricated from these high-strength alloys. Outlined here are some of their properties.

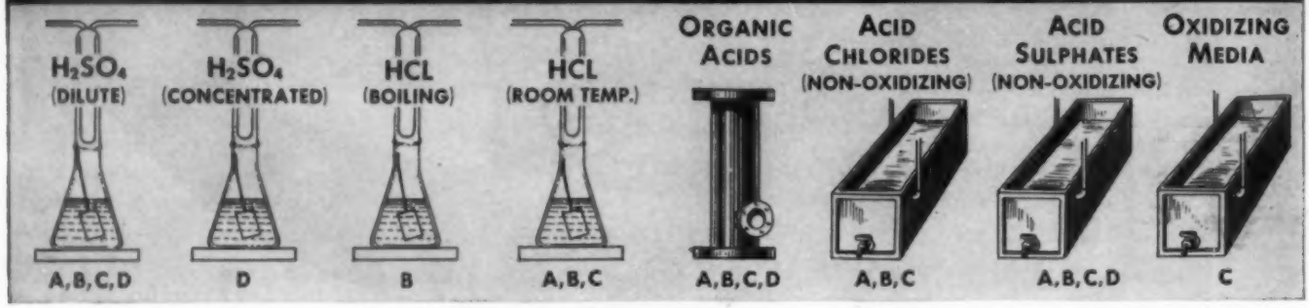
These are the Forms in Which You Can Get Them



These are Some of the Ways in Which You Can Work Them



These are Some of the Corrosive Media They Resist



For Complete Information on penetration tests, available forms, and methods of fabrication of Hastelloy alloys, send for the booklet, "Hastelloy High-Strength Alloys." Test samples of these nickel-base alloys are also available.

HASTELLOY TRADE MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago, Cleveland, Detroit, Houston, Los Angeles, San Francisco, Tulsa

HIGH-STRENGTH NICKEL-BASE ALLOYS FOR CORROSION RESISTANCE

The word "Hastelloy" is a registered trade-mark of Haynes Stellite Company.

A Check List for Wartime Transformer Buyers

Get these 5 Pyranol features and you are sure of reliable service

1. High emergency-overload capacity. The heat storage capacity of Pyranol makes Pyranol transformers ideal for emergency overloads.

2. Stamina to withstand voltage surges. High dielectric strength (inherent in liquid-filled transformers) is an extra safeguard against damage from voltage surges due to lightning or switching operations.

3. Noninflammability. You can't burn Pyranol. No Pyranol transformer has burned, or contributed to a fire. This record, covering 10 years of operating experience, fully justifies the recognition accorded Pyranol transformers by the National Electrical Code.

4. Virtual freedom from maintenance. The efficiency and life of Pyranol transformers do not depend on frequent cleanings and other attention. Pyranol is nonoxidizing and nonsludging. Under normal operating conditions it will maintain its insulating properties through years of service.

5. Protection against moisture and dirt. The pressure-tight steel tank protects vital transformer parts against moisture, dirt, dust, abrasives, and other enemies of transformer reliability.

TRANSFORMER reliability is a big factor in continuity of power supply, and that's essential to maximum war production. Pyranol units have all the features—*plus*—that have made liquid-filled transformers the most nearly trouble-free electric apparatus in service today.

Save Vital Copper, Too

An actual example of savings: One new war plant saved 30,000 pounds of copper (because of shorter runs of heavy secondary conductor) by installing Pyranol transformers indoors at load centers.

Moreover, by locating transformers near the load, you get better voltage regulation and lower line losses.

For complete information on Pyranol transformers for your requirements, consult your G-E representative. Or, write General Electric, Schenectady, N. Y.

333-kva Pyranol transformer, incorporating Spirakore design. Rated 60 cycles, 2400/4160Y volts to 240/480 volts.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

402-43-5100

Here's **THE RIGHT GAS MASK for EACH* of YOUR GASEOUS HAZARDS**

. . . WITH BETTER VISION, BETTER COMFORT, TOO!

M·S·A Industrial GAS MASKS

EQUIPPED WITH THE ALL-VISION FACEPIECE

Check your Hazards!

EACH OF 13 INTERCHANGEABLE M.S.A. CANISTERS PROTECTS AGAINST ONE OR A GROUP OF THESE GASES . . . *WRITE FOR BULLETIN ED-7!*

Acetic Acid
Acetaldehyde
Acetone
Acrolein
Alcohol, Methyl
Alcohol, Wood
Alcohols
Aldehydes
Ammonia
Amyl Acetate (Banana Oil)
Aniline
Benzine
Benzol
Benzyl Chloride
Benzyl Bromide
Bromine
Butyl Alcohol
Butyl Acetate
Camphor
Carbon Bisulphide
Carbon Tetrachloride
Chloracetone
Chloracetophenone
Chloracetyl Chloride
Chlorine
Chloroform
Chlorpicrin
Collodion
Creosote
Cyanogen Chloride
Dimethyl Sulphate
Esters
Ether
Ethyl Acetate
Ethyl Chloride
Ethylene
Ethylene Dichloride
Fluorine
Formaldehyde
Furfural
Gasoline
Hexane
Hydrochloric Acid
Hydrofluoric Acid
Hydrogen Bromide
Hydrogen Chloride
Hydrogen Cyanide
Hydrogen Cyanide and Cyanogen Chloride
Hydrogen Cyanide with Tear Gas
Hydrogen Sulphide
Japan
Kerosene
Lacquer
Methyl Bromide
Methyl Chloride
Naphtha
Naphthalene
Nicotine
Nitric Acid
Nitrobenzene
Pentane
Phenol
Phosgene
Phosphorus Pentachloride
Phosphorus Trichloride
Propane
Silicon Tetrachloride
Sulphur Chloride
Sulphur Dichloride
Sulphur Dioxide
Sulphuric Acid
Sulphur Trioxide
Tar
Thiophosgene
Tin Tetrachloride
Titanium Tetrachloride
Toluidine
Toluol
Trichlorethylene
Turpentine

**For protection against carbon monoxide and gases containing it, and for various combinations of toxic gases, use the M.S.A. ALL-SERVICE GAS MASK.*

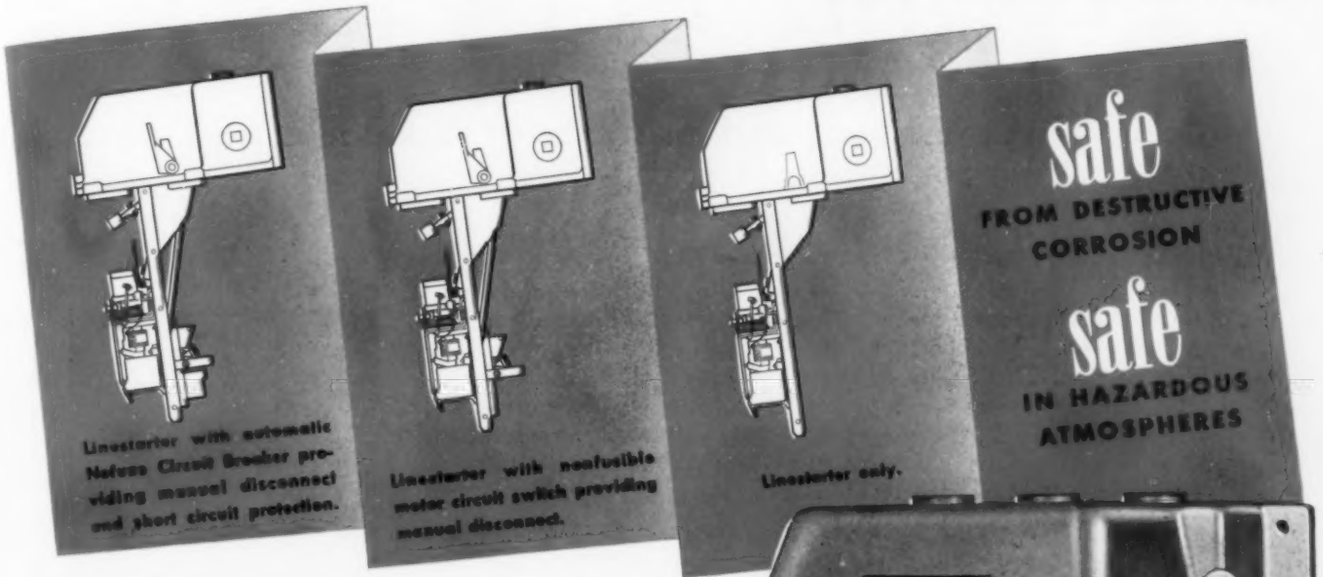
● In the chemical industry, working under high production pressure, potential respiratory dangers from toxic gases call for constant vigilance and ready protection for workers. The M.S.A. Industrial Gas Mask answers the problem of safety in emergencies—today, as for years past in every industry—with a broad selection of canisters for protection against practically all industrial gases; better wearing ease, and unhampered working freedom. The All-Vision Facepiece permits unobstructed vision through wide-area lenses, provides comfortable, gas-tight fit on any face, and is easy to clean and keep clean. Let us show you the many reasons for this Mask's top popularity in industrial gas protection!

MINE SAFETY APPLIANCES CO.

BRADDOCK, THOMAS AND MEADE STS., PITTSBURGH, PA.

DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

HERE'S SAFE MOTOR CONTROL TO FIT THE JOB


Linestarter with automatic Nofuse Circuit Breaker providing manual disconnect and short circuit protection.
Linestarter with nonfusible motor circuit switch providing manual disconnect.
Linestarter only.
safe
FROM DESTRUCTIVE CORROSION
safe
IN HAZARDOUS ATMOSPHERES

WESTINGHOUSE OIL-IMMERSED LINESTARTERS DESIGNED TO MEET PROCESS INDUSTRY DEMANDS

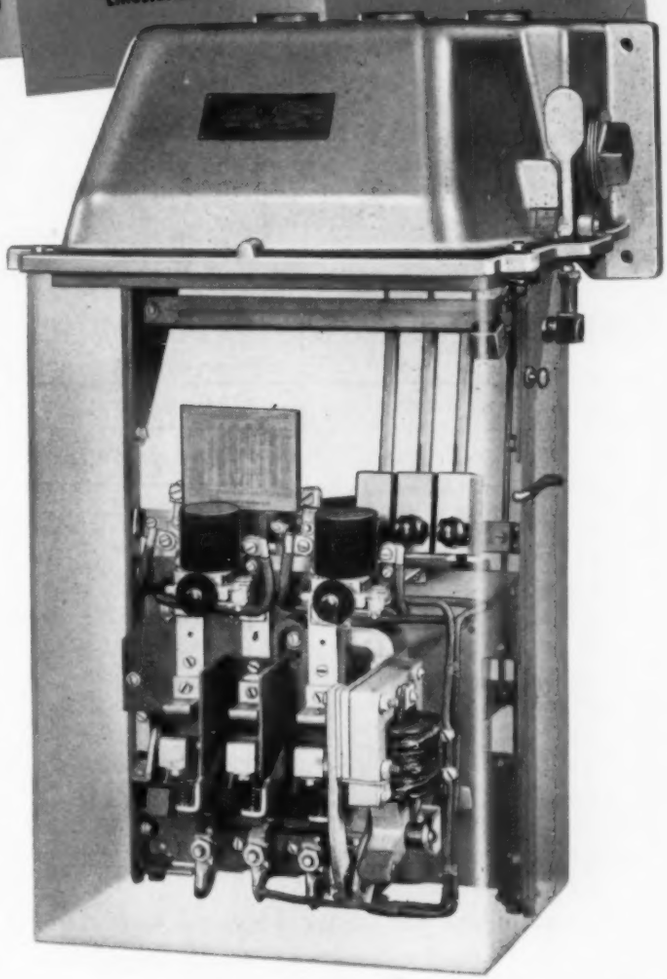
Whatever your control problems may be, you can get the exact protection you want with Westinghouse Oil-immersed Linestarters. Weatherproof and dust-tight, they are designed with or without circuit protection to give safe motor control in explosive or corrosive atmospheres.

Oversize copper contacts reduce maintenance time and costs because they carry heat away faster, wear longer.

All parts are easily inspected with perfect safety. Positive interlock prevents lowering the tank until the circuit is opened. When the tank is down, the circuit cannot be closed unless the interlock mechanism is intentionally tripped.

With the new overhung top casting design, installation is simplified.

Westinghouse makes a complete line of oil-immersed starters for controlling squirrel-cage motors. Your Westinghouse representative will be glad to give you complete information about them. Or, write today for descriptive folder. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-21226



Westinghouse

OIL-IMMERSED MOTOR STARTERS FOR HAZARDOUS AND CORROSIVE ATMOSPHERES

Caustic Soda

Data on wartime uses, and resistance of Nickel to corrosion

The use of caustic soda in a wide variety of chemical processes makes this product especially important to war production. The ability of Nickel to withstand corrosion by caustic and to protect its purity is likewise widely recognized. All important producers, in fact, process caustic in Nickel or Nickel-clad steel.

Nickel resists all concentrations of caustic at all temperatures better than any other commercially usable metal. Its combination of strength and corrosion-resistance permit use of economical thickness, and assure long equipment life. Equally important, Nickel has made possible the economical commercial production of high-purity, iron free caustic... achieving a degree of purity which meets such rigid specifications as those of the rayon industry.

Data on the resistance of Nickel to corrosion by caustic soda is given in the table below. For assistance in connection with caustic and other corrosion problems please communicate with the INCO Technical Service.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

★ ★ ★ ★ ★ ★

Multi-circulation triple effect caustic evaporator made of Nickel. Capacity 60 tons daily.

Resistance of NICKEL to corrosion by CAUSTIC SODA

Exposure Condition (Concentration of Chemical in Per cent by Weight)	Corrosion Rate	
	Miligrams per sq. Diameter per day (mdd.)	Penetration in inches per year. (ipy.)
In evaporator concentrating from 30% to 50% for 16 days	0.6	0.0001
In evaporator concentrating to 70% for 6 months	9.0	0.0015
In storage tank for 50% solution at 130° to 165°F.	0.13	0.00002
In storage tank for 70% solution at 195° to 240°F. for 90 days	0.97	0.0001

Wartime Uses of CAUSTIC SODA

RAYON: Used in viscose process to keep liquids alkaline, dissolve cotton linters.

SOAPS: Made by reaction of fats with caustic. Glycerine is a by-product.

RUBBER: Rubber from used tires treated with caustic to remove cotton fabric.

DETERGENTS: Tri-sodium phosphate made by treating phosphoric acid with caustic.

FINE CHEMICALS: Many fine chemicals, intermediates, and dyestuffs made by caustic fusion.

ALUMINUM: Large quantities employed in Bayer process for treatment of bauxite.

PETROLEUM: Used for removal of sulfides and for neutralizing after acid treatments.

Caustic also used for: **TIN RECOVERY • METAL CLEANING • LEATHER TANNING • METALLURGICAL PRODUCTION PAPER MANUFACTURE • STARCH MANUFACTURE • TEXTILE PRODUCTION • VEGETABLE OIL REFINING**

★ ★ ★ ★ ★ **INCO NICKEL ALLOYS** ★ ★ ★ ★ ★

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • NICKEL • "Z" NICKEL

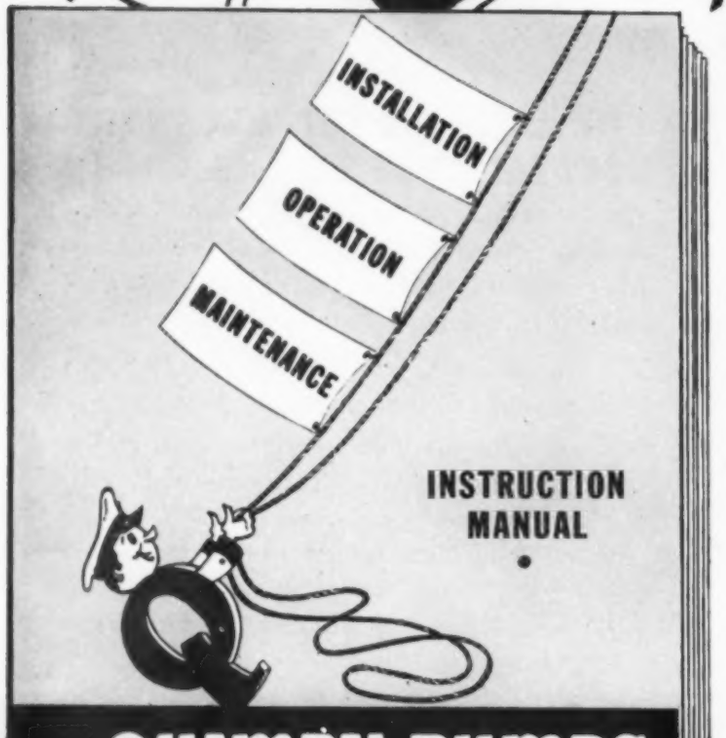
Sheet... Strip... Rod... Tubing... Wire... Castings

HARNESSING THE
WHIRLWIND!
THE BUELL DUST RECOVERY SYSTEM DOES IT... with the famous van Tongeren Cyclone, the only method of harnessing the whirlwind energy of the "double eddy current" (present in all cyclone-type collectors) and putting it to work to give you greater collection efficiency on all dust sizes.
No Other Collector Employs This Principle
Only Buell gives you the *plus* value of the van Tongeren System's greater recovery efficiency. *It saved one user $40,000 in 13 months!* Buell (van Tongeren) Dust Collectors have many other advantages . . . all good reasons why so many industrial leaders prefer Buell. Investigate!
24-page bulletin, "Dust in Industry" sent on request
buell
DUST COLLECTORS

BUELL ENGINEERING COMPANY, INC., 70 PINE STREET, NEW YORK

NATION-WIDE SERVICE THROUGH OFFICES OF EITHER BUELL ENGINEERING CO. OR B. F. STURTEVANT CO.

A LIFE SAVER TO ALL PUMP USERS!



QUIMBY PUMPS

★ YOUR CUE TO BETTER PUMPING PRACTICE ★

Practical Data on

PUMP INSTALLATION OPERATION AND MAINTENANCE

Many pumps now in service cannot be replaced until after the war so it is essential that their effectiveness be maintained. Whether you operate a Quimby Pump or some other type you will find many practical suggestions in the new Quimby Instruction Book to assist you in getting the most effective service from new or existing equipment.

This useful, "dirty-hand" information is offered to instruct those whose experience may be limited and to serve as timely reminders for more highly trained personnel. Typical subjects covered are,

INSTALLATION, PIPING, ALIGNMENT, STARTING, PACKING and STANDING IDLE.

Each major subject is illustrated with animation to place interesting emphasis on essential points.

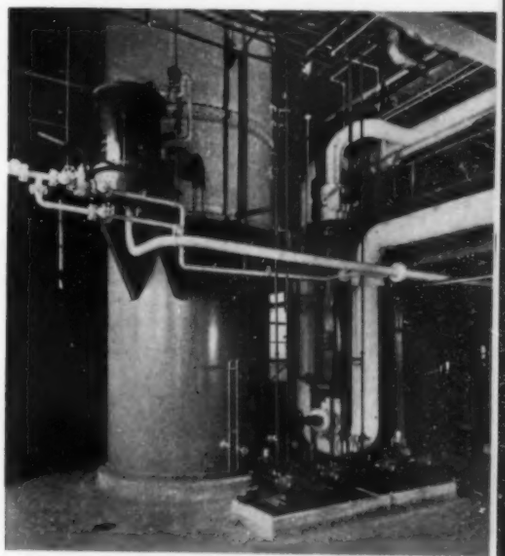
QUIMBY PUMP CO., INC.
351 Thomas St. Newark, N. J.

Write today on your company letterhead for your free copy before it slips your mind. Please request Marine or Stationary edition.

GOOD PUMPING PRACTICE SINCE 1894

BADGER

TOWERS
COLUMNS
STILLS
EVAPORATORS
EXTRACTORS
HEATERS
HEAT EXCHANGERS
KETTLES
PRESSURE VESSELS



For years these have been Badger Specialties. As designed and built today, they embody all that has been learned during decades of service to the processing industries.

This experience has placed us in a position to design and build certain equipment required for many new processes stimulated by the war effort.

Chemical Engineers and Contractors Specializing in Distillation, Evaporation, Extraction and Solvent Recovery

E. B. BADGER & SONS CO.

Boston, Mass.

New York **Philadelphia** **San Francisco** **London**

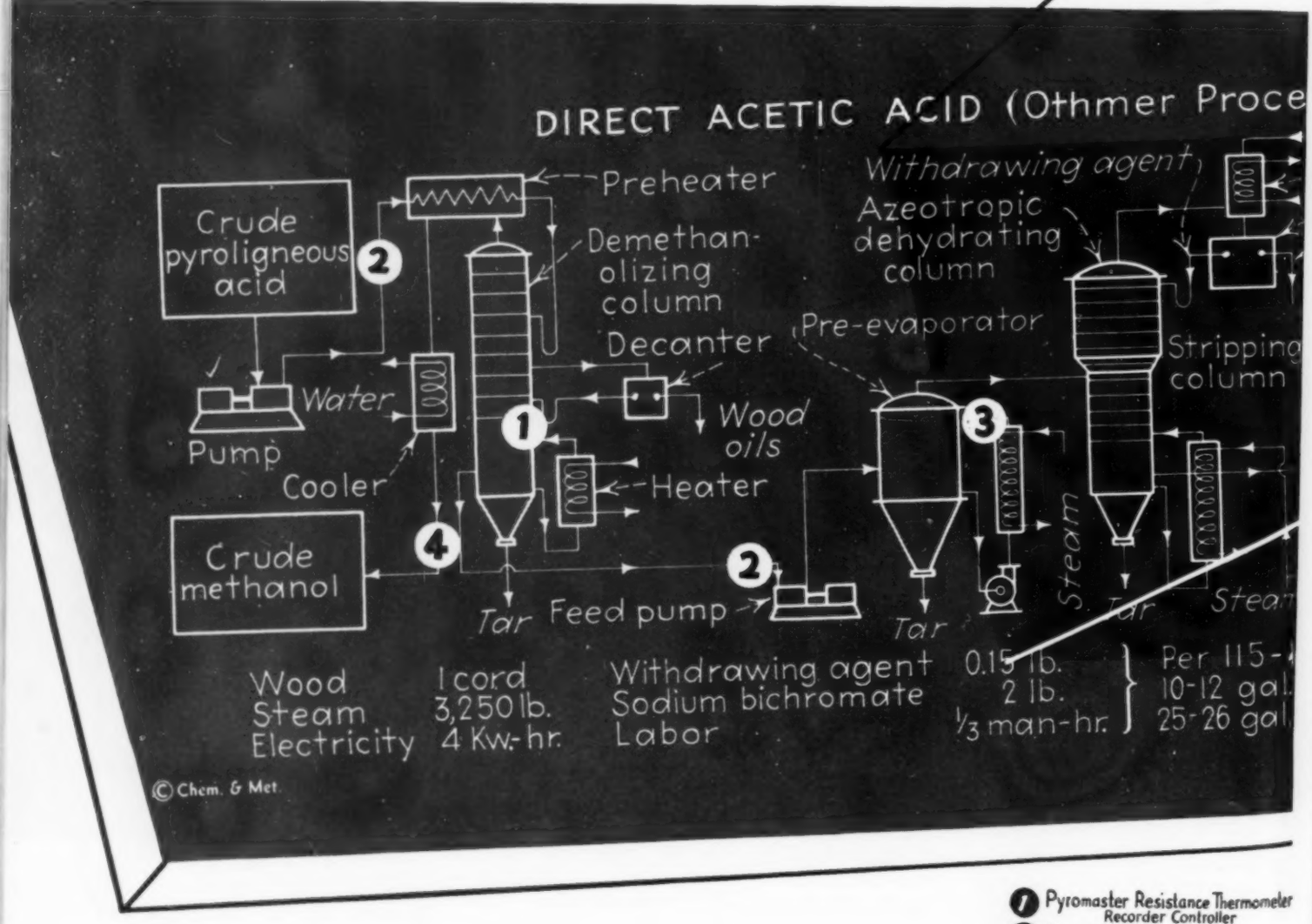
6-BCO-4

A TIP FROM ACID PLANTS

on Cleaning waste out of a production line

Waste of materials and steam, irregularities of product quality and cost, customer complaints — all shrink sharply when automatic controls banish the unpredictable human element from chemical processes.

In many parts of your plant, no doubt, controlling, recording or indicating instruments are lowering costs and raising quality. But are you getting *all* you could from instrumenting your process?

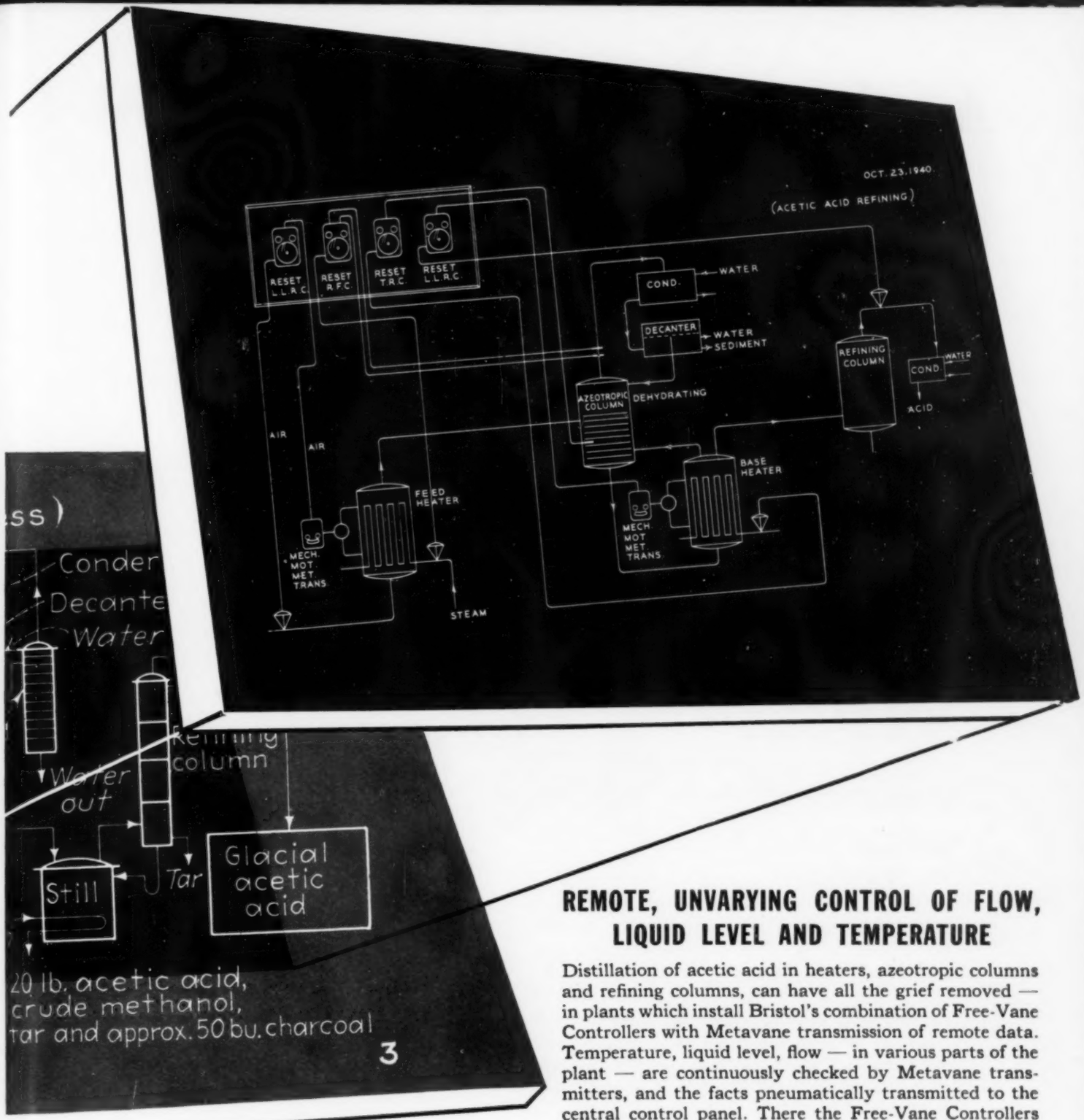


1. Pyromaster Resistance Thermometer Recorder Controller
2. Flow Recorder Controller
3. Temperature Recorder Controller
4. Flow Recorder

FREE PLANS BUILT TO FIT YOUR PLANT

just send your flow sheet

Take out just a few minutes to sketch roughly the flow of your process or processes, and mail to Bristol's Application Engineers. Their suggestions for automatic safeguards of quality and costs are yours without any obligation. Naturally, we also know how to keep a secret.



REMOTE, UNVARYING CONTROL OF FLOW, LIQUID LEVEL AND TEMPERATURE

Distillation of acetic acid in heaters, azeotropic columns and refining columns, can have all the grief removed — in plants which install Bristol's combination of Free-Vane Controllers with Metavane transmission of remote data. Temperature, liquid level, flow — in various parts of the plant — are continuously checked by Metavane transmitters, and the facts pneumatically transmitted to the central control panel. There the Free-Vane Controllers maintain unusually rigid uniformity, due to the free-floating action of the control mechanism, which prevents distortion or delay in indication and correction of any variations. Changes in adjustments are easy to make without dismounting controllers. Plenty of other aids to costs and quality, in acids, heavy chemicals, and *your* industry, are being obtained with the help of Bristol engineers.

WRITE FOR FREE BULLETINS . . .
No. 513 on Metavane transmission of remote data . . . No. 4051 on Free-Vane Controllers

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THE BRISTOL COMPANY
109 Bristol Road, Waterbury, Conn.
The Bristol Co. of Canada, Ltd.
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BRISTOL

Engineers Process Control for Better Products and Profits

AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS

Available Now in Drum Quantities

Three Aliphatic Chemicals with Interesting Applications

THESE three synthetic organic chemicals with unusual properties are now available in drum lots for "limited quantity" applications. Tetraethanolammonium Hydroxide is a strong base which breaks down to a weak tertiary amine at high temperatures . . . Diethyl "Cellosolve" is an excellent mutual solvent . . . Hexanol is a useful source of normal hexyl groups. Each has other valuable properties as well.

You should investigate these interesting materials. They may have profitable applications in your products or processes. Write for samples and quotations.

Tetraethanolammonium Hydroxide

$N(C_2H_4OH)_4OH$

. . . as commercially supplied, is a 40 to 41 per cent solution of the hydroxide in water and methanol. It is a strong base approaching the fixed alkalies in alkalinity. Although its water solutions are stable at ordinary temperatures, they decompose on heating to form triethanolamine. Thus it has value where it is desirable to destroy a strong base that has been useful at lower temperatures. It is an excellent solvent for certain types of dyes, but is not a solvent for cellulose.

Hexanol

$CH_3(CH_2)_4CH_2OH$

. . . a normal or straight-chain alcohol . . . is a water-white liquid and an excellent solvent for hydrocarbons, linseed oil, shellac, rosin, gums, and dyestuffs. It is used principally for the introduction of the normal hexyl group in the manufacture of hypnotics, antiseptics, and certain other pharmaceuticals. Hexanol shows promise as a component in hydraulic brake fluids. It is only 0.58 per cent soluble in water at 20°C., while water is 7.2 per cent soluble in it. Its specific gravity is 0.8208 at 20/20°C.; its boiling point is 157.2°C.; and its flash point is 165°F.

Diethyl "Cellosolve"

$C_2H_5OCH_2CH_2OC_2H_5$

. . . is a colorless medium-boiling (121.4°C.) liquid with a slight ethereal odor. Since it dissolves both oils and water, it is an excellent mutual solvent. It is a solvent for nitrocellulose, and this solubility is increased by the presence of alcohol. In colloidal systems, such as detergents or wetting agents of limited water solubility, it permits dilution with water with less tendency to gel or cloud. A stable compound, it may be used as an inert reaction medium.

For information concerning the use of these chemicals, address:

CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street **New York, N. Y.**

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

ROLLING STEEL FOR WAR WEAPONS

FOUR STAND continuous 4-high rolling mill for reducing steel slabs to the required thickness.

FROM mills like these throughout America come plates and sheets for ships, tanks and other weapons of war . . . at the world's highest rate of output.

Giant 4-high mills like those above are kept at maximum operating efficiency by being lubricated with Texaco.

And not only in steel mills, but throughout all industry, and regardless of types, sizes, makes or models of machines in use, Texaco is maintaining high output under today's operating conditions.

Trained Texaco Lubrication Engineers will gladly cooperate with your factory personnel in the selection and application of Texaco Lubricants for your specific equipment. Just phone the nearest of more than 2300 Texaco distribution points in the 48 States, or write: The Texas Company, 135 East 42nd Street, New York, N. Y.

Care for your Car ..for your Country

THEY PREFER TEXACO

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

FOR YOUR ENJOYMENT

FRED ALLEN every Sunday night. See your local newspaper for time and station.

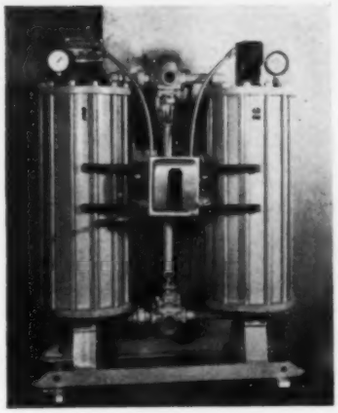
TEXACO

TEXACO Lubricants and Fuels

FOR ALL INDUSTRIES

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

WHY WORRY ABOUT MOISTURE IN COMPRESSED AIR



Lectrodryer using activated aluminas provides freedom from moisture problems in air operated controls.

Many users of air operated control equipment have found that LECTRODRYER thoroughly dries their compressed air. LECTROFILTERS used with LECTRODRYERS provide freedom from oil vapor troubles.

If you want more information on LECTRODRYER equipment for this purpose tear out this page, fill in the blanks, and mail it to us so that we may quote you on LECTRODRYER equipment for handling your requirements.

1. *Do you want to dry compressed air continuously 24 hours a day?*_____

   If not, how long are the drying periods?

   _____

   This information will enable us to determine whether a single or dual adsorber LECTRODRYER should be used. Single adsorber LECTRODRYERS dry air intermittently, dual adsorber LECTRODRYERS operate continuously.

2. *What is the volume of air to be dried at atmospheric temperature and pressure and at what pressure will the drying be carried on?*_____

3. *At what temperature will the air enter the LECTRODRYER?*_____

   *Will the air or gas be saturated at this temperature?*_____

   The answers to the two questions above will enable us to determine the proper size and type LECTRODRYER for your use.

   Air-cooled electric reactivated LECTRODRYERS handle small quantities of compressed air; larger quantities sometimes require water-cooled LECTRODRYERS which may be steam reactivated or electrically reactivated.

4. *How dry do you want the air?*_____

   LECTRODRYERS dry compressed air to dew points as low as minus 60 degrees C and even lower. If you don't know exactly how dry the air should be, indicate whether extreme dryness or moderate dryness is desired.

5. *Do you have 110 volt, single phase, 60 cycle power available?*_____

   Most small LECTRODRYERS operate from this power supply.

6. *Do you have 220 volts, single phase, 60 cycle power available?*_____

   *Do you have steam at approximately 100 pounds pressure?*_____

   Larger LECTRODRYERS operate either from 100 pounds steam or 220 volt power supply as specified by the Purchaser.

PITTSBURGH LECTRODRYER COMPANY

32 ND STREET AND A. V. R. R., PITTSBURGH, PA.

Control...

THE CRITICAL FACTOR IN BATTLESHIP OR STEEL CASTING

THOUSANDS of tons of steel hurtle forward when the battleship moves into action... heavy guns and thick armor plate give and take mighty blows... yet victory or defeat are determined by delicate instruments of *control.*

Grasp that principle of control as the critical factor ... and you'll begin to see why Lebanon's job planning is vitally important to users of steel castings. Lebanon's Operating Department carefully studies designs (preferably, before patterns are made) to be sure that they conform with tested steel foundry practice. If design improvements are indicated, Lebanon suggests them to the customer.

Patterns are then made and checked to blueprint for dimensional correctness. Next the job is planned for production, with consideration given to the location and size of feed heads... methods of rigging and gating. This helps to assure sound castings.

If advisable, sample castings are made to be checked dimensionally... then inspected by destructive or non-destructive methods for soundness of section before being released for production.

There is a premium on quality in steel castings and Lebanon pays that premium in the form of control at every possible point. That's why Circle Ⓛ Castings are chosen to guard the integrity of such products as Andale Strainers and Mason-Neilan Regulators.

Lebanon metallurgists are studying future applications for alloy and carbon steel castings of controlled quality... and are ready to discuss significant developments with forward looking organizations.

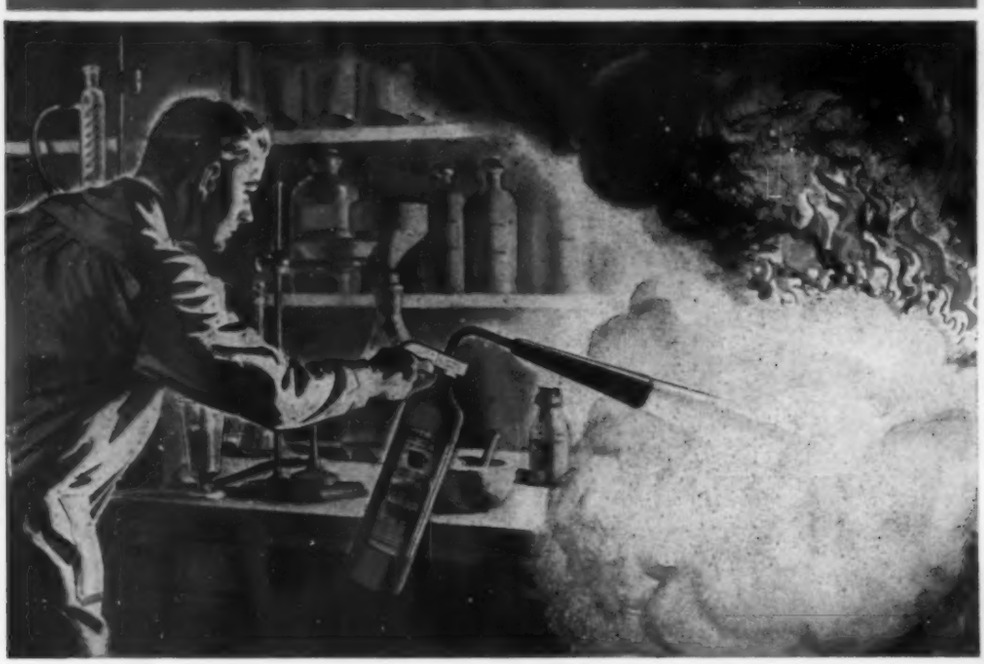
LEBANON STEEL FOUNDRY · LEBANON, PENNA.

ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

LEBANON *Stainless and Special Alloy* **STEEL CASTINGS**

CIRCLE L

FIRE AND HOW TO FIGHT IT!



PULL THE TRIGGER—*KILL THE FIRE!*

Here it is! . . . the fastest-action, easiest-to-operate fire-killer you ever saw!

There's a pistol grip for one-handed action and for quick maneuverability. There's a trigger-control for fast, easy discharge. A finger's touch discharges the unit. Only Kidde has these sensible, simple features.

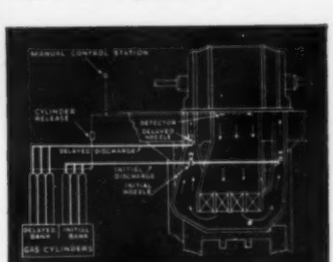
You can get Kidde trigger-control extinguishers with 2 or 4 lbs. of carbon dioxide capacity. Use them against flammable liquid or electrical fires. Hang Kidde units in laboratories and garages, near work benches and on your trucks. When fire strikes, Kidde snuffs it out fast in a flurry of carbon dioxide snow-and-gas. Just *aim . . . shoot . . . kill the blaze!*

Think this over: Newly-hired workers may not know how to handle some industrial-type extinguishers in emergency. *But anyone knows how to pull a trigger!*

WHEELED FIRE-FIGHTERS

Easy portability combines with big fire-fighting capacity in the heavy-duty Kidde Wheeled Units. With carbon dioxide capacities of 50, 75 and 100 lbs., these big extinguishers handle fires too tough for hand-models. Each Kidde Wheeled Unit is equipped with a long hose and has a specially designed nozzle for prompt fire-control. Located at the grip is a valve handle which enables the fire fighter to control the discharge as he attacks the blaze.

Kidde Wheeled Units are widely used to protect outdoor hazards and to guard large machinery, difficult processes.



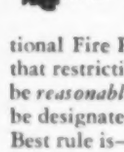
GUARD ELECTRICAL MACHINERY

Do you know about *built-in* protection of electrical equipment? Do you know how to kill fire *automatically* in generators and other rotating machines? You can handle this job with Kidde Built-in Systems.

For control rooms, transformer vaults, get a total-flooding Kidde installation. Kidde carbon dioxide snow-and-gas is safe, even on "live" equipment. Too, Kidde confines damage to that done by fire itself. Underwriters give full approval to Kidde portables and Kidde Systems for use against electrical fires.

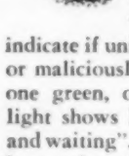
Kidde — Walter Kidde & Company, Incorporated, 633 West St., Bloomfield, N. J.

"NO SMOKING" MEANS *NO SMOKING*



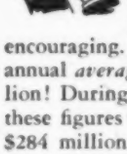
Courts are handing out stiff fines and jail sentences to workers who violate smoking rules in defense plants. Unions are cooperating, too. National Fire Protection Ass'n warns that restrictions should at all times be *reasonable*. Often safe areas may be designated as O.K. for smoking. Best rule is—insist on strict observance whenever safety is threatened.

RED MEANS DANGER



When fire breaks out, extinguishers must be ready for action. Built-in electrically operated Kidde Systems may be equipped with tell-tale panel to indicate if unit has been discharged or maliciously disabled. Panel has one green, one red light. *Green* light shows Kidde System "ready and waiting". *Red* means System has been released, must be recharged.

DO YOU LIKE STATISTICS?



N.F.P.A. reports fire loss for last 25 years totals *over $10 billion.* 1941 total is an estimated 5% increase over 1940. Ten-year trends are much more encouraging. In the period 1922-31 annual *average* loss was $506 million! During last 10 years we cut these figures to annual average of $284 million. *This wasted money buys 1100 medium bombers!*

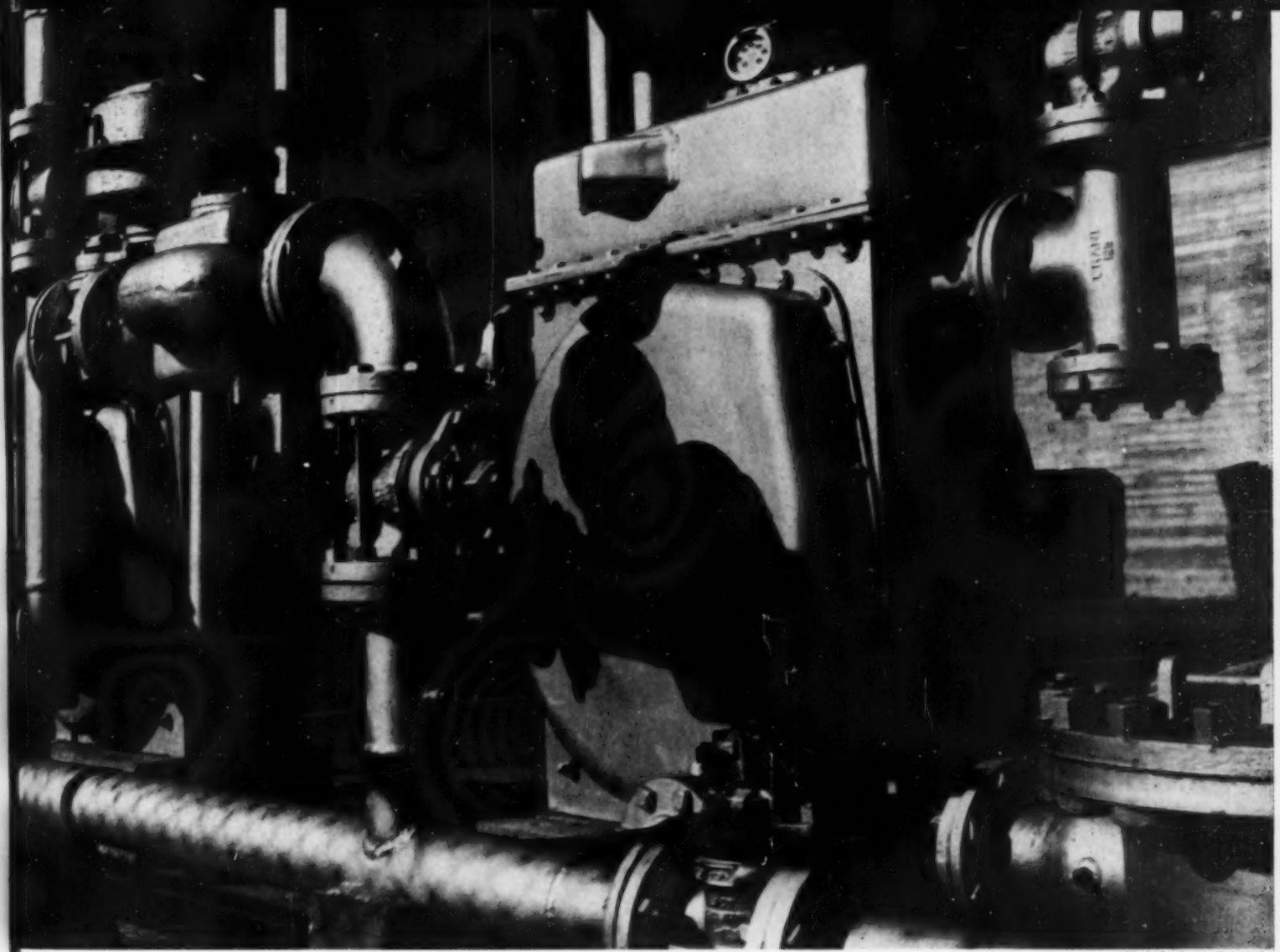


Photo by James Leonard

Natural Color photograph showing Nordstrom Valves, Emco Large Capacity Gas Meter and Emco Balanced Valve Regulator

Control of your lines assured for life, with Nordstroms

Nordstrom has led the way in lubricated valve development. In addition to being the first to apply the principle of pressure lubrication, Nordstrom has successively incorporated the Diaphragm Seal, "Sealdport" lubrication, Hypreseal construction for highest pressures, Merchrome Coating for extreme conditions of corrosion and erosion, and numerous other improvements. All Nordstrom Valves incorporate the basic principles of rotary plug action, made practical and efficient by pressure lubrication. Their simple, rugged, compact design assures longer life and freedom from leaks in *any* service recommended by our engineers.

SIZES: ½" to 30".

PRESSURES: Vacuum to 15,000-lbs. test.

OPERATION: Wrench or gear.
(Also with Cylinder, local or remote.)

TYPES: Emco-Nordstrom, Standard and Hypreseal.

DIRECTION: Straightway and Multiport.

METALS: Semi-Steel, Malleable Iron, Nordco Cast Steel, Stainless Steel, Bronze, and special alloys.

Ask for Descriptive Bulletins

Nordstrom

LUBRICATED VALVES

Sealdport Lubrication

MERCO NORDSTROM VALVE COMPANY – *A Subsidiary of Pittsburgh Equitable Meter Company*

WORLD'S LARGEST MANUFACTURERS OF LUBRICATED PLUG VALVES; GASOLINE, OIL & GREASE METERS

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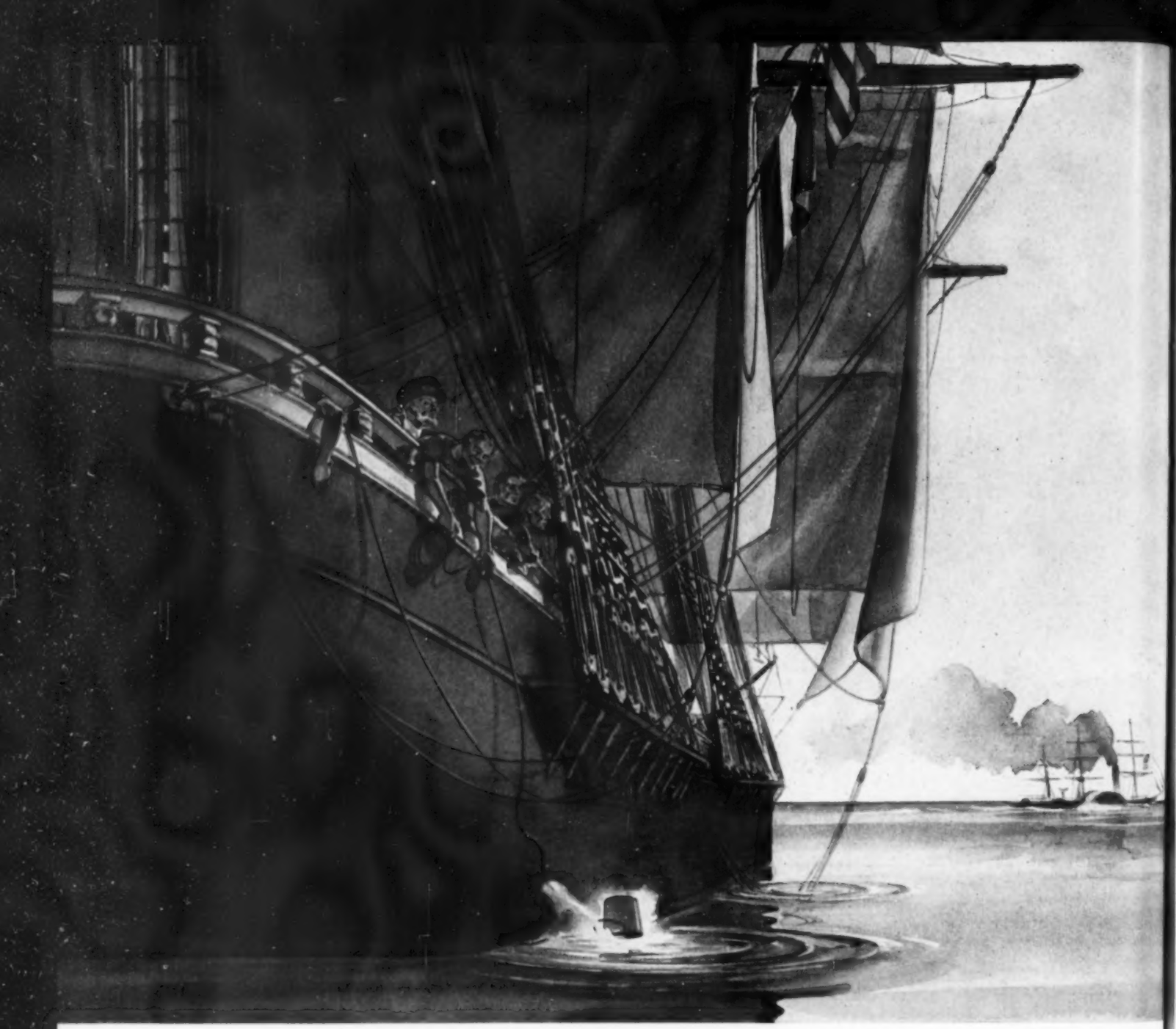
CANADIAN Licensees: Peacock Bros., Ltd., Montreal. • *EUROPEAN Licensees:* Audley Engineering Co., Ltd., Newport, Shropshire, Eng. *SO. AMER. Rep.:* The Armco International Corp. • *Office:* Middletown, O.

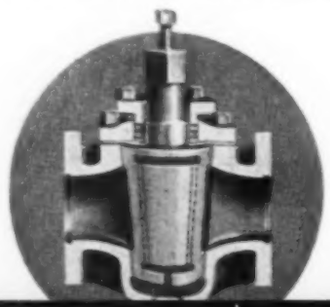
PRODUCTS: Nordstrom Lubricated Valves; Air, Curb and Meter Cocks • Nordco Valve Lubricants • EMCO Gas Meters • EMCO-McGaughy Integrators EMCO Regulators • Pittsburgh-National Meters for Gasoline, Grease, Oil, Water and other Liquids • Stupakoff Bottom Hole Gauges



"Cast down your bucket!"

Lost at sea for many days a ship suddenly sighted a vessel. From the unfortunate ship's mast a signal was given, *"Water, water; we die of thirst!"* The distant vessel at once replied, *"Cast down your bucket."* And again the signal, "Water, water, we die of thirst!" Back came the answer, "Cast down your bucket where you are." Again and again the same signal; the same reply. Finally in desperation the captain of the distressed vessel cast down a bucket. It came up full of fresh, flowing water from the mouth of the mighty Amazon River.

Cast your bucket right in your plant, right in your fields of operation. Check your flow lines and discover what your valve costs really are. Then let Nordstrom Valve engineers prove the definite savings you can make by replacing costly-operating valves. By use of Nordstrom Multiport Valves you can invariably save extra piping, extra fittings, and make one or two valves do the work of three or four. Perhaps your valve replacements have been all too frequent. Then consider the extended life of Nordstroms. They conclusively prove their economy, even when their initial cost is slightly more than that of ordinary valves. So again we say, "cast your bucket" for *lower* valve costs on all your flow lines. A signal to Nordstrom engineers is sufficient.



...KEEP UPKEEP DOWN *with* **NORDSTROM VALVES**

75 YEARS AGO, *one Sunday morning, two men strolled through Nicetown, a part of Germantown*

They were seeking a location for a steel plant, and found it in a hole in the ground, where water came up. More than water has come from that hole since, for Midvale has pioneered in alloys, in steel research, in meeting the increasing demands on steel made by the automobile, the oil and process industries, and today by stark, all-out war. Under present conditions some things cannot be discussed. But in far-flung places, where American boys are facing heavy odds, they can be glad, and we can be glad, for a Sunday morning stroll, seventy-five years ago, that started—Midvale.

1867 75TH ANNIVERSARY 1942

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA, PA.

OFFICES: New York • Chicago • Pittsburgh • Washington • Cleveland • San Francisco

MIDVALE

NEW BULLETIN ON GRINDING AND PULVERIZING

The Mill Built Like A Sphere Requires Less Iron and Steel; Also Less Power To Perform A Given Grinding Job. Bulletin 13-D Tells Why.

Contains Information On

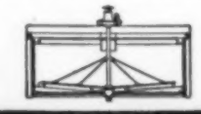
Wet and Dry Grinding
Methods of Control
Details of Construction
Specifications on Sizes
2-ft. to 12-ft. Diameter
With Weights, Ball Charges
Power Requirements and Capacities

Write For Your Copy.

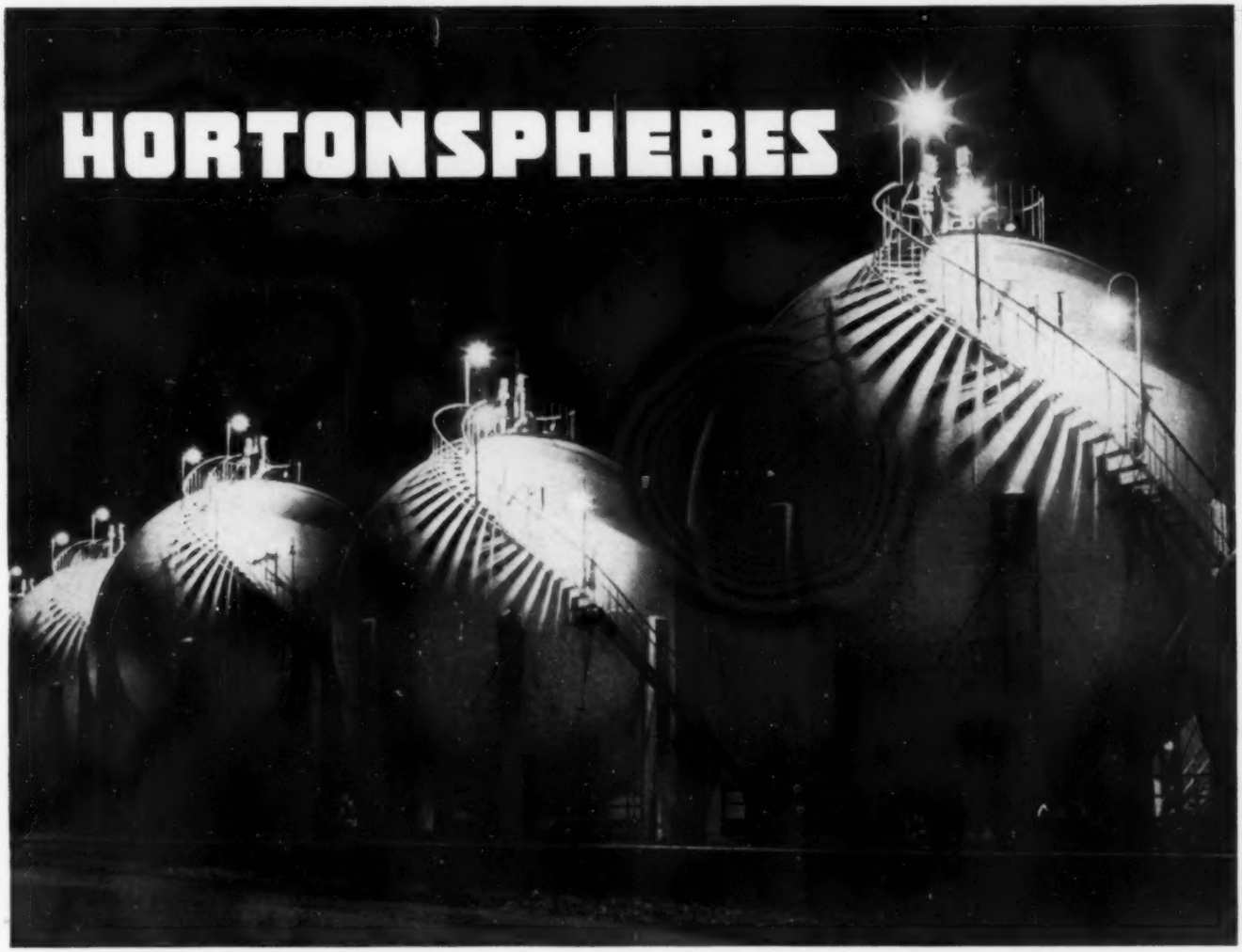
HARDINGE

COMPANY, INCORPORATED – YORK, PENNSYLVANIA

New York, 122 East 42nd Street Chicago, 205 West Wacker Drive San Francisco, 501 Howard Street Toronto, 200 Bay Street



CONICAL MILLS | COUNTER CURRENT CLASSIFIERS | THICKENERS CLARIFIERS | RUGGLES-COLES DRYERS | CONSTANT WEIGHT FEEDERS | TUBE ROD AND BATCH MILLS



..a suggested method for handling BUTADIENE

Experience has proved that pressure storage, as afforded through the use of Hortonspheres, is one of the best methods available for preventing volumetric loss and protecting the inherent product quality of volatile oil products. Because of the basic vapor-saving principle upon which spheres operate, they will also be able to meet problems that will exist in the storing and handling of one of industry's newest achievements . . . BUTADIENE, important ingredient in the production of synthetic rubber in this country.

Hortonspheres are now widely used for petroleum products requiring pressures of from 25 to 100 lbs. per sq. in. to prevent evaporation loss. A closed container is essential, of course, because gas pressure can build up only in a vapor-tight vessel. Thus, the fact that pressure does exist in spheres proves that no vapor loss is occurring. In other words, no loss can be experienced as long as venting does not take place.

CHICAGO BRIDGE & IRON COMPANY

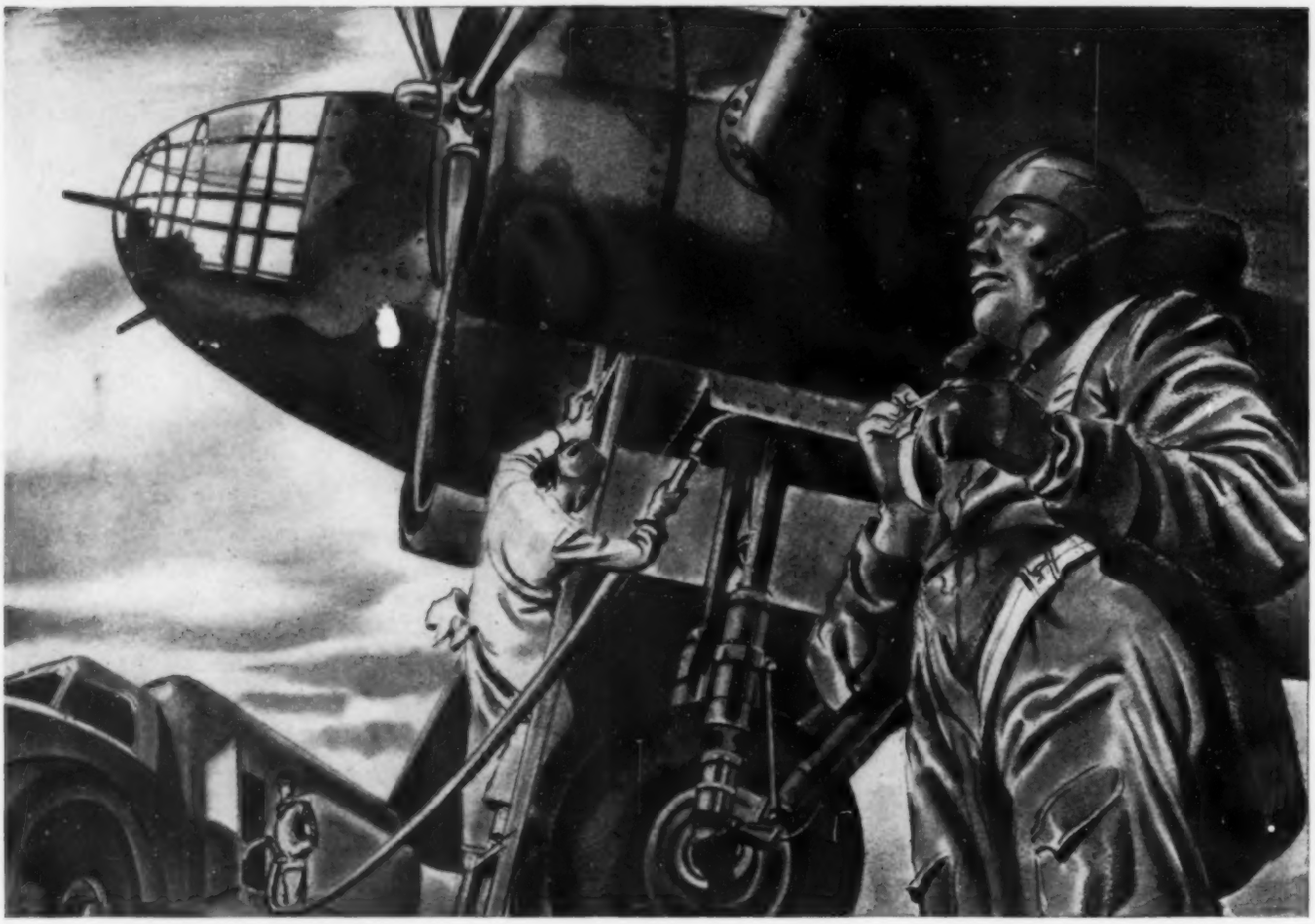
Chicago .....2124 McCormick Bldg.
Detroit.....1583 Lafayette Bldg.
New York.....3318-165 Broadway Bldg.
Havana.....402 Edificio Abreu

Philadelphia....1625-1700 Walnut St. Bldg.
Cleveland.....2220 Guildhall Bldg.
Birmingham.....1510 North Fiftieth St.
Washington.....632 Washington Bldg.

Houston.....5603 Clinton Drive
Tulsa.....1623 Hunt Bldg.
Greenville.....York Street
San Francisco.....1022 Rialto Bldg.

Plants in BIRMINGHAM, CHICAGO and GREENVILLE, Pa. *In Canada:* HORTON STEEL WORKS, LIMITED, FORT ERIE, ONTARIO

• Another advertisement telling how different American industries are speeding up wartime production •



We've got to keep giving him 13 EXTRA *to win the war*

Taylor Instruments are helping America's planes fly farther faster...

▶ We'll win this war in the air. We'll win it because our planes are powered by the world's best gasoline.

Our planes use high-powered, 100-octane gasoline. Our enemies depend on gasoline which averages 87-octane. This 13-point lead gives an American pilot ⅓ more power from his fuel than his opponent gets. Our boys can climb out of anti-aircraft fire 40% faster . . . fly higher than enemy planes of the same weight . . . get off the ground one-fifth faster. Our 100-octane gas reduces the fuel load so our bombers can carry 20% to 30% more bomb load, or fly farther with heavier armament.

We've got to "fill 'er up" for ourselves and our allies with three times as much 100-octane aviation gasoline as we're producing now—increase production to 5 million gallons a day! We can. We're going to. We're doing it. Taylor Instruments are helping the speed-up.

From pilot plants through commercial plants, Taylor Instruments and Taylor engineers have been a vital help in producing high-octane gasoline. Now *every* gasoline refiner considers instruments essential. Taylor Instruments insure precision processing—automatically accurate and constant control of complicated chemical and physical reactions—complete, dependable uniformity—lower operating costs—more, *better* production.

With Taylor Instruments indicating, recording and controlling temperatures, pressures, liquid levels, rates of flow in all the perplexing, exacting refining operations, America's great oil industry *is* producing the high-grade gasoline and lubricating oil we need—and *can* produce more . . . *more* . . . MORE!

Uncle Sam and our allies are relying on Taylor Instruments to help produce:

100-OCTANE AVIATION GASOLINE
. . . in plants of the biggest producers of this type of fuel.

HIGH-GRADE LUBRICATING OIL
. . . in plants producing the quantities needed by tanks, cars, planes.

BETTER ASPHALT
. . . in plants furnishing this "quick take-off" surfacing for airfield runways and highways.

Without help from the oil industry, America couldn't win the war. Without the aid of automatic control instruments of the types made by Taylor, the oil industry couldn't hope to do its staggering job. Without Taylor Instruments, many another American industry could never have speeded up victory production. Are Taylor Instruments helping you do *your* war work? Have you called in Taylor engineers, to suggest ways of *getting more* out of your present equipment? Are you really tuned up to turn it out? Taylor Instruments will help you *now*—America needs you *now*. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. Makers of the famous "Not 1 but 5" Fulscope Controllers.

Taylor
Indicating Recording Controlling
TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS

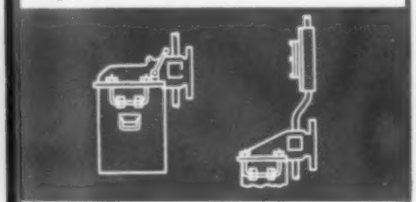
★ ★ ★ **HELP BEAT 'EM BY BUYING U. S. DEFENSE BONDS** ★ ★ ★

WHY TWO DEVICES?

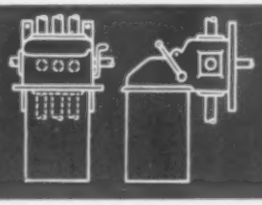
ONE* CAN DO THE JOB

*** A combination starter is a magnetic starter plus a circuit breaker**

One Installation Job Instead of Two. The combination of a circuit breaker and a starter in one control unit means that you have to mount only *one* device. You save on both installation time and expense.

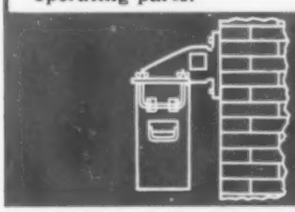


Wiring Made Easy. Conduit entrances from five directions permit the entrance of conduit from top, bottom, rear, or either side. This feature eliminates awkward, time-taking, right-angle fittings.



Simple to Mount. Wide-spaced mounting holes on attachment plates make firm wall mounting easy. No inconvenient, space-consuming frames or racks are necessary.

No Extra Protection Needed. Complete enclosure with gasketed tank makes it possible to install this starter outdoors without extra protection. Also, dripping or splashing liquids can't get at the operating parts.



Readily Interchangeable. Interchangeable overload relay coils fit overload protection to the motor controlled. The starter can be applied to a different motor by simply changing the relay coils.

Easy to Maintain. This combination starter is easy to get at. Just loosen two wing nuts, drop the tank, and the entire operating mechanism is exposed.

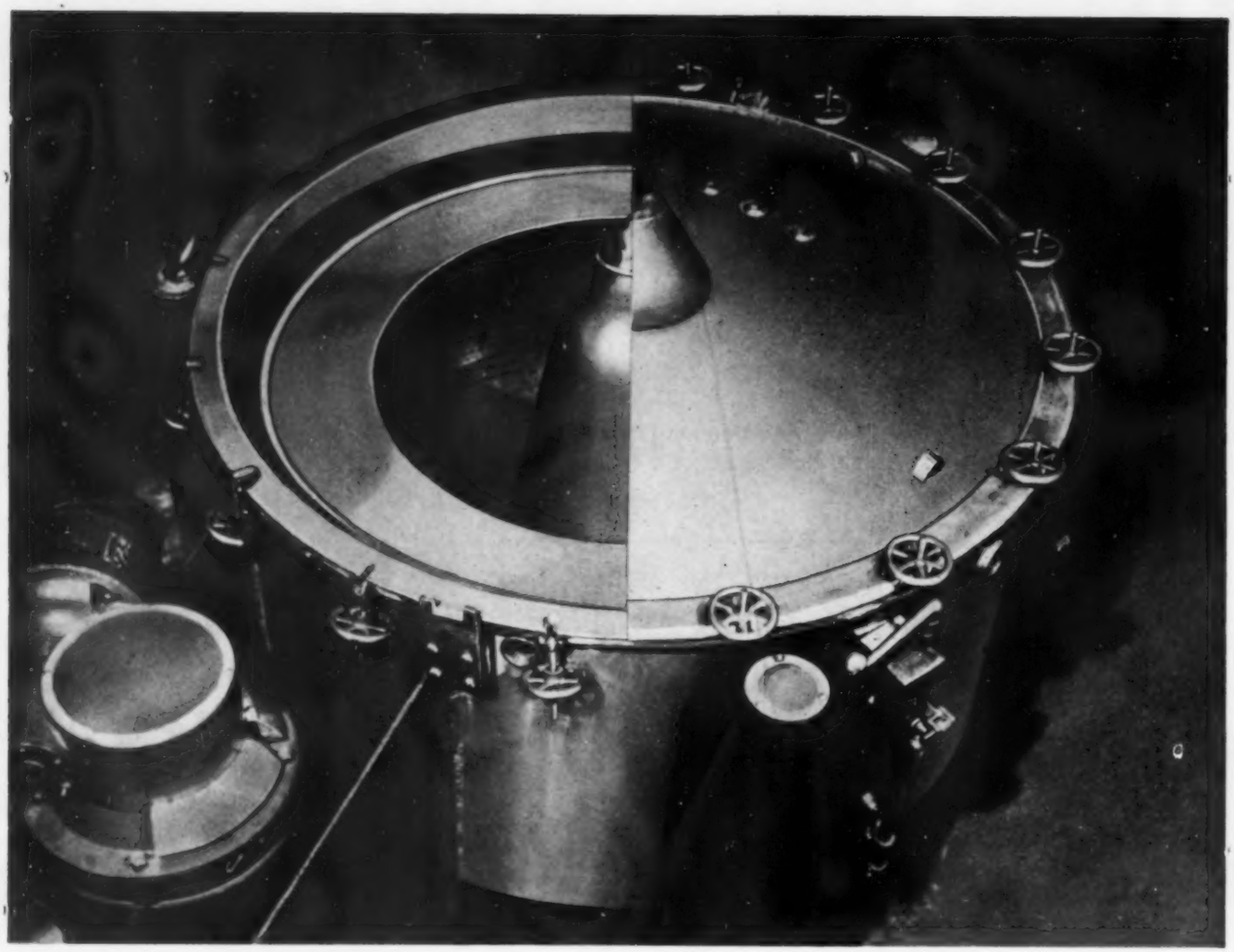
. . . and Save You Time and Space 6 WAYS

Any one of these features makes it important that you investigate this G-E 600-volt, oil-immersed combination starter. Ask your G-E representative for complete details, in Bulletin GEA-3541. *General Electric, Schenectady, New York.*

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

Gid-73-5450



How Many Years B. C. Is Your Plant?

If your plant is still "B. C." — *Before Centrifugals* — this may be a good time to plan on an "A. C." future. A future of increased production, lower costs, more profitable operations . . . perhaps a wider market . . . with the help of A T & M.

For many plants, "B. C." meant slow, space-consuming equipment in extracting, precipitating, dehydrating, impregnating and coating processes—kiers, autoclaves, tanks, filters, drying machinery.

For those plants, centrifugals engineered by A T & M have often doubled production, cut floor space requirements in half, combined a delicate or otherwise impossible series of operations in one swift, space-saving machine.

No Improvement Since Aristotle! . . . A T & M Solved This Separation Problem

No improved method of extracting oil from the rind of a fruit had been discovered since ancient times . . . until A T & M engineers went to work on this customer's problem. Proper speed and cycle were quickly found, but, in the necessarily imperforate basket, the oil could not be completely extracted until A T & M devised an ingenious method of adding water at the end of the centrifuging cycle. Final results: more oil in less time from one quick, smooth, continuous operation.

But, in addition to difficult engineering applications, standard A T & M centrifugals in all machineable metals and coatings . . . link suspended, suspended or base-bearing . . . are in service throughout the process industries, and are available to you as national needs permit. A T & M engineers, with due regard to present emergency conditions, will consult with you without cost or obligation. Address American Tool & Machine Co., 1415 Hyde Park Avenue, or 30A Church St., New York, N. Y.

VICTORY FIRST . . .

But A T & M can also help you win the peace. Plan now on the big savings centrifuging can provide in all operations involving:

Extraction	**Precipitation**
Dehydration	**Impregnation**
Filtration	**Coating**

A T & M CENTRIFUGALS SAVE TIME AND SPACE

A T *and* M

Exper

in WAR . . . in PEACE . . .

INDUSTRY CHOOSES REDWOOD FOR THE TOUGH JOBS of . . .

PRODUCTION:

Manufacturers turn to Redwood for a never failing source of material for finished products. Photo shows veneer being applied to Redwood core in furniture manufacture. Redwood proves more satisfactory and economical in hundreds of products. Perhaps it will in yours. Why not inquire?

OPERATION:

The fine, even-grained texture of Clear All Heart Redwood even in large sizes assures that it can be accurately machined without leaving ridges. Photo shows Fourdrinier wire wrapped on Redwood rolls for shipment.

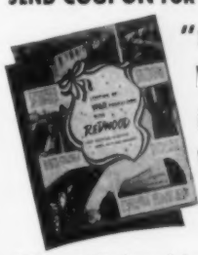
CONSTRUCTION:

THE WINE-CELLAR
A marvel of ingenuity, that has withstood the wear and tear of time—and the worse wear and tear of the spoilers' greedy hand. Though ages old its sturdy beams of redwood, its massive foundation of rock and adobe have kept this Wine-Cellar in its pristine state.

For enduring life, Redwood leads the field. This is proved not only by authoritative laboratory tests but by actual use records. Photo shows "ages old" rough hewn Redwood beam—still sturdy and sound—which has helped keep wine-cellar of old San Fernando Mission "in its pristine state."

REDWOOD . . . *is playing a giant's part in America's war work for it can be depended upon to do things no other wood will do. Specify Redwood for extreme durability and easy workability—for low shrinkage, low thermal conductivity—for high resistance to rot, to fire, and to many hot and cold acids and alkalies.*

SEND COUPON FOR NEW BOOK



"STEPPING UP WAR PRODUCTION WITH REDWOOD"

California Redwood Association
405 Montgomery Street, San Francisco

Please send copy of new book, "Stepping up War Production with Redwood." Also send data on Redwood for

_____.

Name_____

Company_____

Address_____

City_____

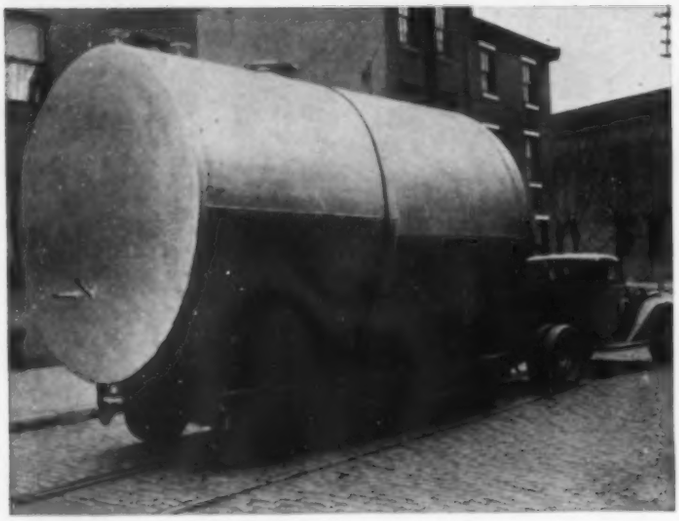
Experience says: You can do it better with

Redwood

SEQUOIA SEMPERVIRENS . . . EVERLIVING

Industry Chooses Redwood for the Tough Jobs!

★ ★ CONSERVE STRATEGIC METALS WITH LUKENS CLAD STEELS ★ ★



PHENOL STORAGE TANK: For handling of phenol for the manufacture of synthetic resins, this tank, 10′ 6″ in diameter and 18′ 6″ overall length, was fabricated of 10% Lukens Nickel-Clad Steel by Liberty Coppersmithing Company, Philadelphia, Pennsylvania.

Producers and Users of PHENOL

Conserve 80% to 90% of pure nickel and Inconel with equipment built of Lukens Nickel-Clad and Inconel-Clad Steels

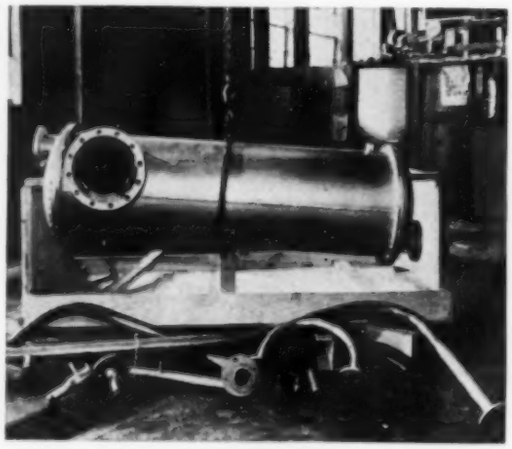
One plant solved its phenol storage problems with a large 12,000 gallon tank fabricated of 10% Lukens Nickel-Clad Steel — so 90% *less* solid nickel was required for this essential equipment. In the fabrication of equipment for the recovery, manufacture, storage and transportation of phenol, every pound of vitally needed nickel or Inconel goes from five to ten times as far by using 20% or 10% Lukens Nickel-Clad or Inconel-Clad Steel.

It is vital to victory to protect equipment from corrosion and products from harmful metallic contamination — and at the same time to conserve vitally needed metals that do both. That's why the qualities of Lukens Nickel-Clad, Inconel-Clad and Monel-Clad Steels are doubly valuable today.

RESIN REACTOR: This jacketed mixing kettle was fabricated from 10% Lukens Nickel-Clad Steel by Downingtown Iron Works, Inc., Downingtown, Pennsylvania. It is equipped with agitator blades, shaft and stuffing boxes of pure nickel.

PREVENTING METALLIC CONTAMINATION IN HANDLING PHENOL

Phenol presents a serious problem in handling and storage. Contamination with metallic salts may be responsible for imparting color to phenol and act catalytically in subsequent reactions. Lukens Nickel-Clad or Inconel-Clad Steel provides the same corrosion resistance and prevention of product contamination as solid nickel or Inconel. Considerable corrosion data is available and will be furnished on request.



PHENOL CONDENSER: In building the shell of this condenser, equipped with nickel heating element, 20% Lukens Nickel-Clad Steel was used by The Lummus Co., Bayonne, N. J.

This new 28-page bulletin, "Lukens CLAD Steels", contains over 125 illustrations of clad steel equipment, with comprehensive tables of recommended applications according to industry and principal corrosive substance. Write for copy on your company letterhead.

LUKENS STEEL COMPANY • *World's Largest Plate Mill* • **161 LUKENS BUILDING • COATESVILLE, PA.**

Lukens NICKEL-CLAD CLAD INCONEL-CLAD Steels MONEL-CLAD

BEHIND FRONT LINE BATTERIES

– BATTERIES OF TOLHURST CENTRIFUGALS SPEED UP WAR PRODUCTION

GUN COTTON is only one of the many vital war materials being processed faster with TOLHURST Centrifugals. Like powder mills, many chemical, food and ordnance plants are speeding up their output with TOLHURST Centrifugals. In times like these, you cannot afford to overlook this *principle of plant production:*

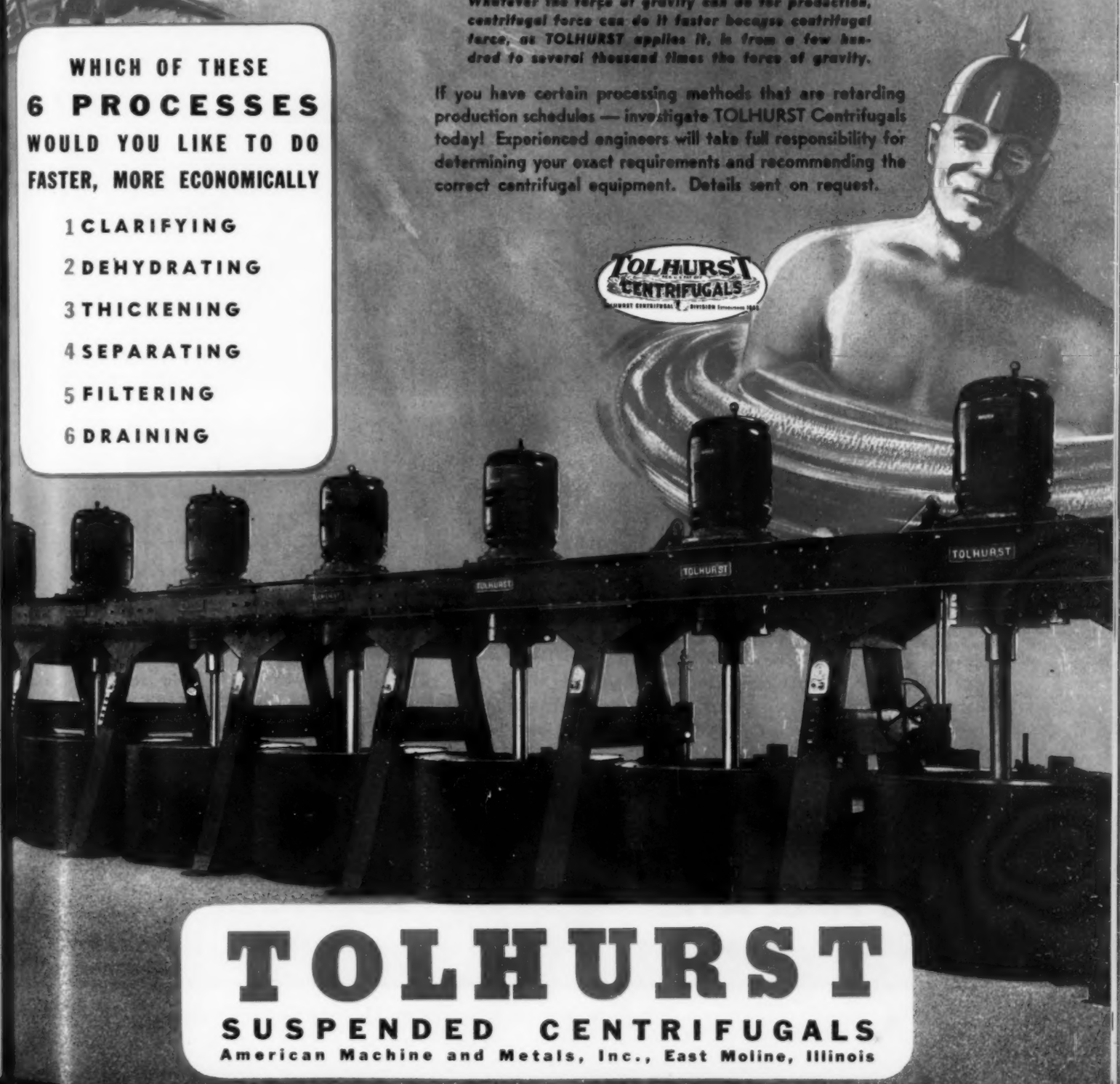
> ***Whatever the force of gravity can do for production, centrifugal force can do it faster because centrifugal force, as TOLHURST applies it, is from a few hundred to several thousand times the force of gravity.***

If you have certain processing methods that are retarding production schedules — investigate TOLHURST Centrifugals today! Experienced engineers will take full responsibility for determining your exact requirements and recommending the correct centrifugal equipment. Details sent on request.

WHICH OF THESE
6 PROCESSES
WOULD YOU LIKE TO DO FASTER, MORE ECONOMICALLY

1. CLARIFYING
2. DEHYDRATING
3. THICKENING
4. SEPARATING
5. FILTERING
6. DRAINING

TOLHURST CENTRIFUGALS



TOLHURST

SUSPENDED CENTRIFUGALS

American Machine and Metals, Inc., East Moline, Illinois

LET KELLEY

Speed work on that WOOD TANK

Any size Any wood* Anywhere!

Specialists in the design, manufacture and installation of wood tanks of every description. Can give you *rush work* on wood tanks and catch boxes for waste disposal systems, T.N.T., and smokeless powder plants. Also for Sulphuric Acid and Picric Acid manufacturing units.

Fabricating plants in Boston, Massachusetts (one of the largest in the East) and Johnson City, Tennessee. We carry a stock of lumber of over 5 million feet B.M. Do this—write or wire us and let us show you how *fast* we can get that war job done—at a price that will satisfy you. Emergency Service and facilities count today—we give you both . . . *use them!* Write or wire for prompt cooperation.

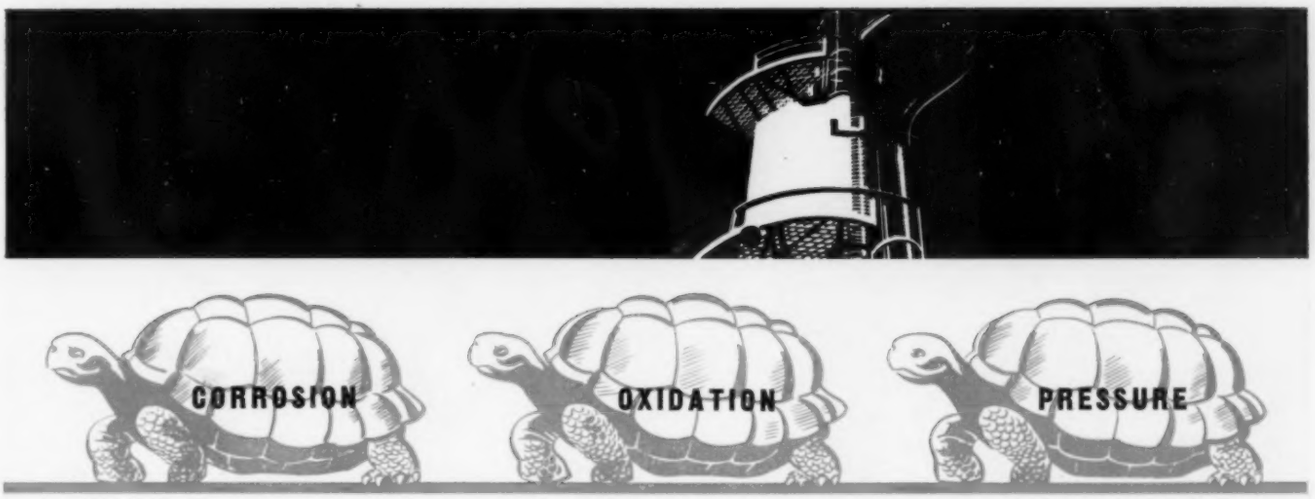
We build tanks of DOUGLAS FIR CALIFORNIA REDWOOD FLORIDA CYPRESS Long leaf yellow pine

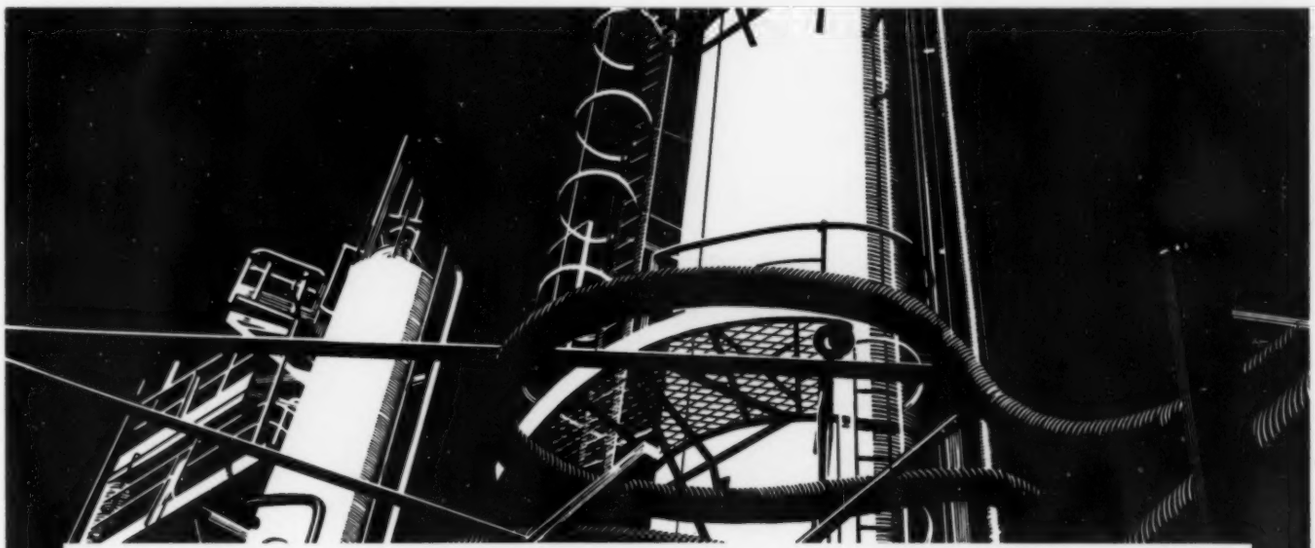
O. G. KELLEY & COMPANY

103 PARK AVE., NEW YORK CITY

NEPONSET STA. BOSTON, MASS. JOHNSON CITY, TENN.

LEAD BURNING ANYWHERE IN AMERICA





SLOW.. BUT SURE!

Corrosion, oxidation and pressure may be *slow*, but they are *sure* enemies of refinery, power, chemical and paper tubes.

Your best defense is proper application of this little formula — take your *tube cost*, divide by *tube life*, and you will discover your exact *tube expense.*

Compare your tube expense with data taken from our file of hundreds of case histories and you can know whether your tubes *cost too much* or *are not good enough for the job they are required to do.* Consult us without obligation.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

$\frac{TC}{TL} = TE$

Proper use of this formula will bring VICTORY today and win profits in post-war competition.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
SEAMLESS STEEL TUBES

Reliability from "CERTIFIED CASTINGS"

FIG. 1308 Regrinding Globe Valve

FIG. 1310 Regrinding Angle Valve

FIG. 1312 Regrinding Globe Valve, OS&Y

FIG. 1314 Regrinding Angle Valve, OS&Y

FIG. 1322 Regrinding Lift Check, Angle

FIG. 1300 Solid Wedge Gate Valve

FIG. 1302 Double Disc Taper Seat Gate, OS&Y

FIG. 1332 Regrinding Y Valve, OS&Y

FIG. 1328 Regrinding Swing Check

JENKINS CORROSION-RESISTING VALVES

Jenkins Corrosion-Resisting Valves are cast by experts in *pressure casting* work. And the decided superiority shows up in *extra* quality and long, troublefree service!

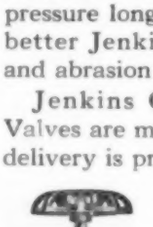
Each casting that goes into a Jenkins Corrosion-Resisting Valve is a "Certified Casting"—X-rayed to show up any flaws, even minute defects that would not be disclosed during machining operations. And the completely assembled valve is thoroughly pressure-tested.

The result is that when you install a Jenkins Corrosion-Resisting Valve you get dependable service under even the *most* adverse conditions. No other valve will keep tight under pressure longer; no other valve can better Jenkins service where heat and abrasion are encountered.

Jenkins Corrosion-Resisting Valves are made in sizes up to 10": delivery is prompt upon proper priority . . . from good supply houses everywhere.

Jenkins Bros.

Jenkins Bros., 80 White Street, New York, N. Y.; Bridgeport, Conn.; Atlanta, Ga.; Boston, Mass.; Philadelphia, Pa.; Chicago, Ill.; Houston, Tex. Jenkins Bros., Ltd., Montreal; London, England.



JENKINS VALVES

For every industrial, engineering, marine and power plant service . . . in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys . . . 125 to 600 lbs. pressure.

FOR INCREASED PRODUCTION WITHOUT INTERRUPTION

NO STUFFING BOX

A *New* WILFLEY WITH

PLASTIC LINING!

Especially resistant to HCL, HFL, ferric chloride, copper chloride and other chemicals up to 250°, this new WILFLEY acid pump is a further development and refinement of the well known WILFLEY line. As in all WILFLEYS, the stuffing box is completely eliminated, along with the usual stuffing-box troubles. No metal comes in contact with solution being pumped. Write for bulletin E4320 and let our engineers make recommendations for a trouble-free installation that will definitely reduce your operating costs.

A. R. WILFLEY & SONS, Inc., Denver, Colorado, U. S. A.

NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY

WILFLEY

ACID PUMPS · UNITARY · BELT DRIVE · DIRECT DRIVE

A baked phenolic resin coating protects this equipment from corrosive attack by chemicals.
To make the best still better—Protective Coatings

You selected Aluminum Alloy processing equipment because it promised long life, improved performance, better products and freedom from contamination. It is fulfilling those promises in every way. However, where it was once good economy on many jobs to permit normal depreciation, and then replace the parts, wartime conditions now require that you get every possible hour of service out of original equipment.

Protective coatings offer one means of making Aluminum Alloy parts last longer. Corrosion-resisting pure Aluminum coatings can be applied by spraying. Oxide finishes are produced by chemical and electrolytic treatment. Of these, the Alumilite* finish, formed on Aluminum by anodic treatment, is among the most durable. It has good resistance to abrasion and mild corrosives.

Chemically-resistant, baked resin coatings have proved very effective where Aluminum is subjected to severe attack. Thousands of parts, so coated, are in service today. Because these coatings are suited to conditions encountered on each job, maximum life for the Aluminum parts is assured.

If you are wondering how to make irreplaceable Aluminum equipment last longer, Alcoa engineers stand ready to serve you. ALUMINUM COMPANY OF AMERICA, 2151 Gulf Building, Pittsburgh, Penna.

**Patented Process, Reg. T. M. U. S. Pat. Off.*

ALCOA ALUMINUM

MEN WORKING
TOGETHER!
THERE IS NO TIME TO LOSE
E
THE NAVY "E" pennant flying over the Bausch & Lomb plant is official recognition of accomplishment in Production for Victory. It symbolizes a singleness of purpose that justifies any sacrifice you or we may be called upon to make.
Awarded July 25, 1941.

An Eye Saved is Production Time Saved

JUST a slight accident. A fragment hurtles straight at the operator's eye. Broke the lens of his safety goggle, of course, but there were no flying splinters of glass. Every workman in the room knows that, without impact-resistant safety lenses, Andy would have lost an eye.

Safety goggles, for industrial use, constitute just one of many Bausch & Lomb products making significant contributions to America's war program. Instruments for industrial research and production—metallographic equipment, spectroscopes, toolmakers' microscopes, contour-measuring projectors—are maintaining precision, increasing production and speeding deliveries in factories all across the nation. Gunfire control equipment — battleship rangefinders, aerial height finders, binoculars, photographic lenses—are of a quality, and on a production schedule, that merited award of the coveted Navy "E."

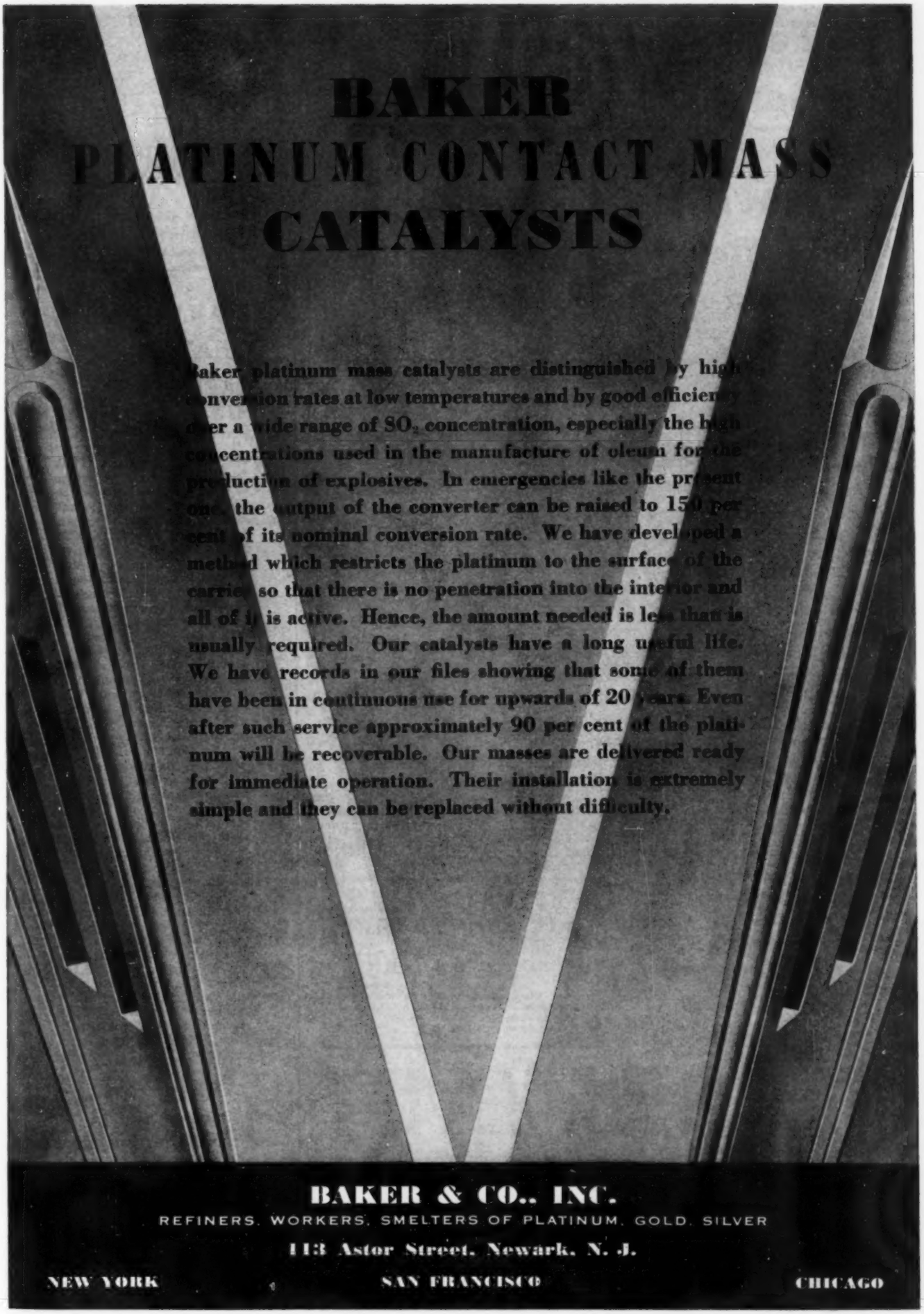
The skills acquired by Bausch & Lomb scientists and technicians through the company's 89 years are being concentrated in the service of America in her day of need.

BAUSCH & LOMB

OPTICAL COMPANY • ESTABLISHED 1853

AN AMERICAN SCIENTIFIC INSTITUTION PRODUCING OPTICAL GLASS AND INSTRUMENTS FOR MILITARY USE, EDUCATION, RESEARCH, INDUSTRY AND EYESIGHT CORRECTION

Electrically-Heated Equipment
• For Accurately-Controlled Temperatures
• At Ranges up to 600° to 800° F
Steam-heated processing equipment for operation at high temperatures must be of much heavier construction than properly designed electrically-heated apparatus. This lighter construction is more economical . . . particularly when special metals are called for. Electric heating is also advantageous when steam at the right temperature is not available and where current cost is low.
For electrically-heated equipment consult us . . . specialists in High Vacuum apparatus, engineers and builders of drying, evaporating, distilling, extracting, impregnating, solvent recovery and other types of processing equipment. Write for catalog.
F. J. STOKES MACHINE COMPANY
5920 Tabor Road Olney P. O. Philadelphia, Pa.
Representatives in New York, Chicago, Cincinnati, St. Louis, Cleveland, Detroit.
Pacific Coast Representative: L. H. Butcher Company, Inc.
F.J.Stokes PROCESSING EQUIPMENT FJS Est. 1895


BAKER
PLATINUM CONTACT MASS
CATALYSTS
Baker platinum mass catalysts are distinguished by high conversion rates at low temperatures and by good efficiency over a wide range of SO_2 concentration, especially the high concentrations used in the manufacture of oleum for the production of explosives. In emergencies like the present one, the output of the converter can be raised to 150 per cent of its nominal conversion rate. We have developed a method which restricts the platinum to the surface of the carrier so that there is no penetration into the interior and all of it is active. Hence, the amount needed is less than is usually required. Our catalysts have a long useful life. We have records in our files showing that some of them have been in continuous use for upwards of 20 years. Even after such service approximately 90 per cent of the platinum will be recoverable. Our masses are delivered ready for immediate operation. Their installation is extremely simple and they can be replaced without difficulty.
BAKER & CO., INC.
REFINERS. WORKERS. SMELTERS OF PLATINUM. GOLD. SILVER
113 Astor Street. Newark. N. J.
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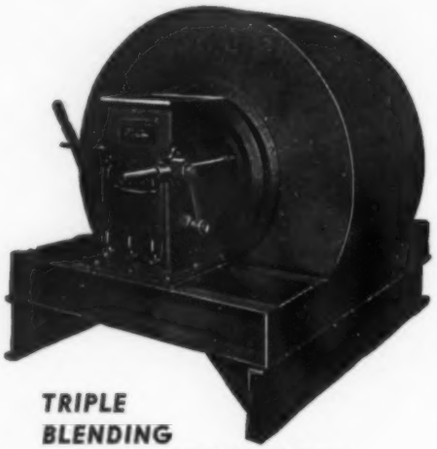
To win this War of Processing and Production

—here's automatically perfect



DRY BLENDING

TRIPLE BLENDING . . NO SEPARATION!

No matter what the weights, densities, sizes, fineness or consistencies, the Sturtevant Dry Batch Dustless Blender will give satisfaction the "triple blend" way!

Delivers weighed and assembled substances for the blend into a large drum, while slowly rotating. As material enters, it is picked up by revolving buckets, carried to top of blending chamber, thrown into stream of incoming feed. This, plus revolving action, is ideal blending. In addition, materials are forced from both sides to middle of drum, adding a *third* blending action with no separating effect—thus producing PERFECT ***triple-effect*** DRY BLENDING. Light substances do not float and remain unblended. Scientifically blends materials, 1st, to a definite chemical analysis; 2nd, various sizes together; 3rd, colors to a precise exactness. Leak-proof because dustless construction. No internal moving parts to break down original composition of material! Intake and discharge through same opening.

RECEIVING

DISCHARGING THROUGH SAME OPENING

★ ★ ★

STURTEVANT AIR SEPARATORS

. . . for removing fine (dust) particles from materials milled or in their natural state. 25% to 300% increased mill capacity . . . 10 to 50% lower power consumption. Cover range from 40 to 400 mesh. Capacities almost unlimited. Send details of your problem . . . we will gladly make recommendations.

STURTEVANT

Products

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MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

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How Industry Will Save $50,000,000 Worth of Solvents Annually

THOUSANDS of pounds of vaporized solvents are lost daily because adequate solvent recovery systems are not used. A solvent recovery system using "Columbia" Activated Carbon can not only prevent this solvent waste, but can speed manufacturing operations and decrease fire and health hazards.

Plants recovering solvents with "Columbia" Activated Carbon . . . those now built and those to be completed shortly . . . have the capacity to recover more than $50,000,000 worth of solvents annually.

Solvent vapor in concentrations as low as 0.25 pounds per thousand cubic feet of air is being recovered, often with efficiencies of 99 per cent or better*. Recovery expense is often less than 0.2 cents a pound and almost never exceeds one cent a pound. Operations can be entirely automatic. Solvent vapor concentrations are automatically kept far below the explosive range—an important safety feature. Solvent recovery plants built sixteen years ago are still operating efficiently and economically.

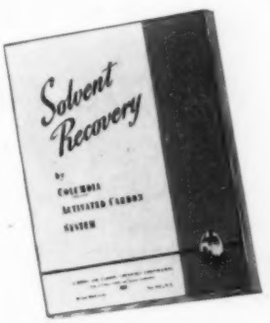
The solvent recovery system employing "Columbia" Activated Carbon benefits from the research done in America's leading laboratory devoted exclusively to carbon products, and from the experience accumulated by Carbide and Carbon Chemicals Corporation in the manufacture and use of industrial solvents.

*Less than one per cent of the collected solvent vapor is lost. Over-all recoveries of all solvent used vary with the vaporizing operation and the type of vapor-collecting system, but have exceeded 95 per cent.

Seven Advantages of The Solvent Recovery System Using "Columbia" Activated Carbon

1. Recovers all types of volatile solvents
2. Recovers solvent vapors in almost any concentration
3. Recovers solvents efficiently in presence of water vapor
4. Recovers solvent vapors with high overall efficiency
5. Recovery plant may be completely automatic in operation
6. Recovery plant investment moderate
7. Recovery expense low

Send For This Book!



This 32-page book tells more about the solvent recovery system using "Columbia" activated carbon and its profitable applications. When you write for a copy, tell us the names and quantities of solvents you vaporize and how you collect the vapors, so that we can help you determine what you can save. No obligation, of course.

The word "Columbia" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.

Representative Industries For Which We Have Designed and Supplied Complete Solvent Recovery Plants Include: *Rayon, Artificial Leather, Lacquer Coatings, Rubber, Rotogravure Printing, Smokeless Powder, Plastics, and Transparent Wrappings.*

For information concerning the uses of "Columbia" Activated Carbon, address:

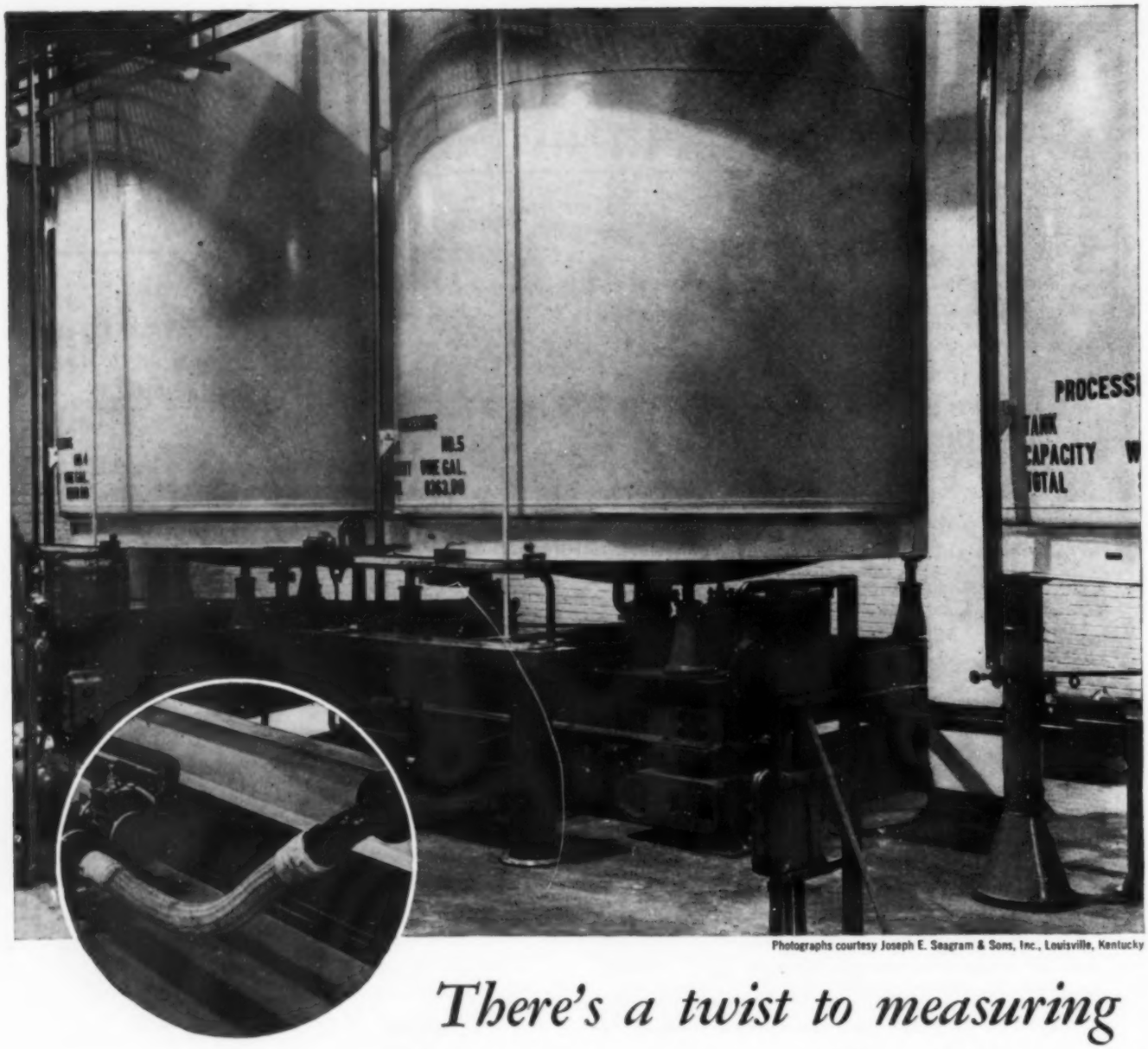
CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS



Photographs courtesy Joseph E. Seagram & Sons, Inc., Louisville, Kentucky

There's a twist to measuring spirits in 8,000 gallon "jiggers"

American Seamless conveys alcohol safely . . . provides compensating flexibility . . . for delicate task on scale tanks at Seagram's Louisville Distillery.

The giant distillery business of this country has undergone a "conversion" too . . . making alcohol for smokeless powder production. And in this, as in other vital war industries, dependable American Seamless Flexible Metal Tubing is helping to do a better job.

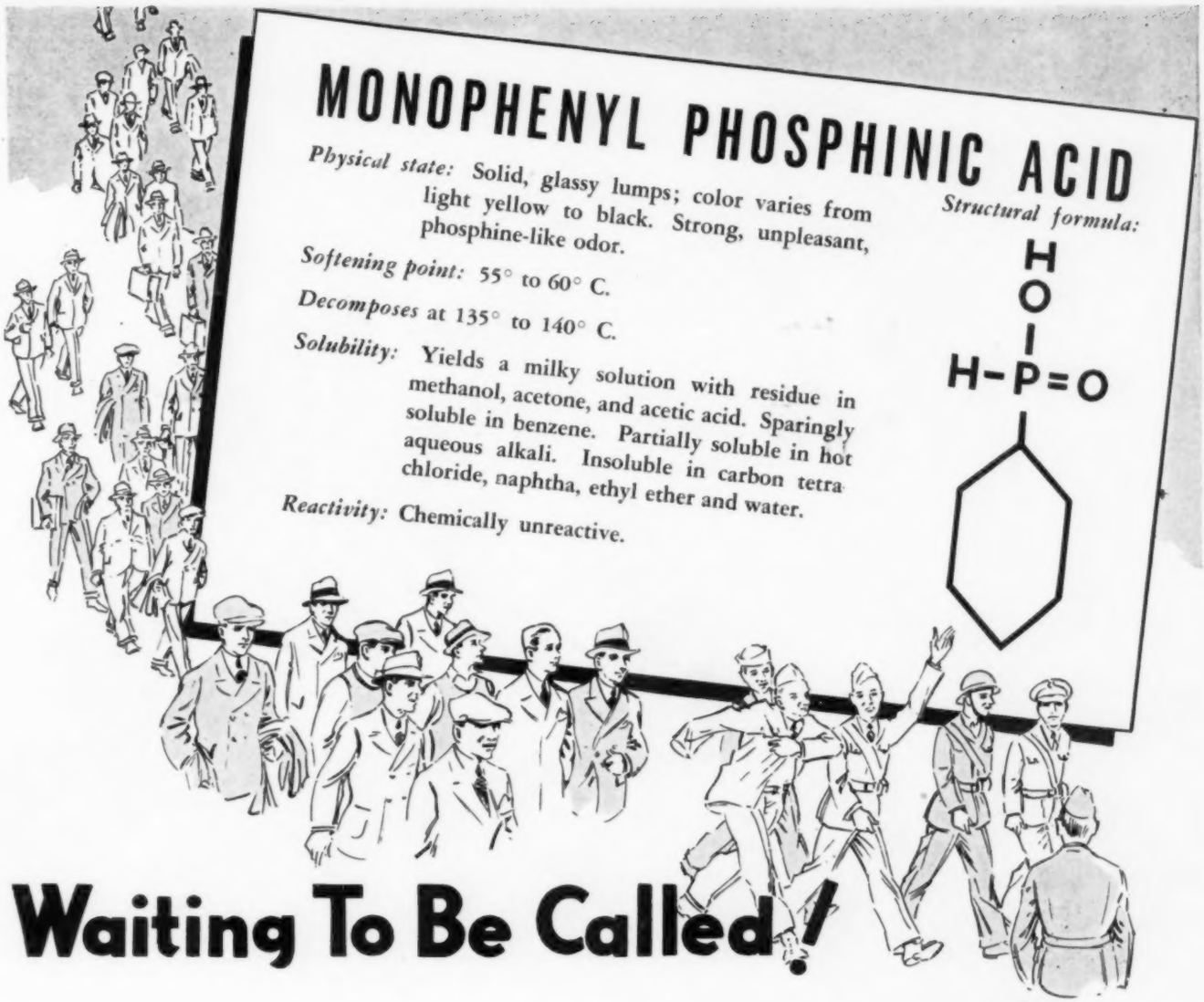
In this case, American Seamless, with its "garden hose" flexibility, compensates for the vertical twist that takes place with weight changes on these large "scale, tanks". At the same time, its tinned bronze interior provides non-toxic contact with the alcohol.

As always American Seamless and other products of American Metal Hose are serving wherever industry needs dependable flexible connectors for conveying steam, air, oil and other liquids and gases. Today, of course, our entire output is serving the war program, and it will doubtless continue to do so until peace is won. 42197

ANACONDA

American Metal Hose

AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY • General Offices: Waterbury, Conn.
Subsidiary of Anaconda Copper Mining Company • In Canada: Anaconda American Brass Ltd., New Toronto, Ontario


MONOPHENYL PHOSPHINIC ACID
Physical state: Solid, glassy lumps; color varies from light yellow to black. Strong, unpleasant, phosphine-like odor.
Softening point: 55° to 60° C.
Decomposes at 135° to 140° C.
Solubility: Yields a milky solution with residue in methanol, acetone, and acetic acid. Sparingly soluble in benzene. Partially soluble in hot aqueous alkali. Insoluble in carbon tetrachloride, naphtha, ethyl ether and water.
Reactivity: Chemically unreactive.
Structural formula:
H
O
H-P=O

Waiting To Be Called!

TODAY . . . millions of young men in all walks of life . . . await the call to the service of their country.

Today . . . in the Victor Research Laboratory . . . scores of phosphorus compounds similarly await the call to service of industry.

Phosphorus unites readily with other elements . . . producing countless unusual compounds such as that briefly described above. For many, no practical use has yet been discovered . . . yet the same was true of others which long since have been "drafted" for important tasks in industry.

Perhaps one of these laboratory compounds may solve an important problem for you. If not . . . tell us your requirements and perhaps we can produce one that will. Our research staff will gladly cooperate with you.

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(In Commercial Production)

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- Pyrophosphoric Acid
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- Magnesium Phosphates
- Potassium Phosphates
- Sodium Phosphates
- Sodium Pyrophosphates
- Potassium Pyrophosphate
- Alkyl Acid Pyrophosphates
- Formic Acid
- Aluminum Formate
- Sodium Formate
- Sodium Boroformate
- Oxalic Acid
- Calcium Oxalate
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- Magnesium Sulphate
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141 West Jackson Boulevard Chicago, Illinois

CHECK THAT CASTING... FAST!

How du Pont Research Speeds War Production

MODERN X-RAY "EYES" are so fast they can peer through five inches of solid steel in two minutes' time! America is rushing ships down the ways to win a war. Thanks to fast du Pont X-ray film, thanks to insulation provided by "Freon"* refrigerant which helps turn giant million-volt X-ray machines into lighter units, castings and welds can be X-rayed faster—and ships made safer!

The Navy X-rays ship castings. Parts of an airplane that might fail or give way in flight—not only motor parts but structural parts as well — are studied under the penetrating rays. Studied and checked! *Fast!*

X-ray scrutiny of welded seams is vital, not only in ships of the sea and air, but in high-pressure pipes and retorts of American industry working at top speed. And the penstocks of the great hydro-electric dams supplying the power to industry are X-rayed on the spot, as the dams are built, to prevent breakdowns that might later shut off precious power. *Fast!*

Helping to speed X-ray eyes of war production is an example of du Pont research. Fast du Pont X-ray film is tailored to modern high-voltage X-ray equipment. The adaption of "Freon" refrigerant to insulating such high-voltage X-ray equipment helps turn cumbersome heavy weights into comparative light weights — quick on their feet, portable, *fast!*

Information which may be useful in solving your particular problems is available to you through the Du Pont Technical Service man. He is backed by 140 years of service to industry...140 years of experience in solving difficult problems. Call on him when you need help. Every problem solved is one more step toward victory.

*Trade Mark Reg. U. S. Pat. Off.

DU PONT
REG. U. S. PAT. OFF

E. I. DU PONT DE NEMOURS & CO., (INC.)
WILMINGTON, DELAWARE

United WE WORK

The American tradition for fearlessness at the front, bravery in battle, is a priceless heritage. And the brave men of '42 are nobly living up to that tradition. We are likewise proud of the spirit being shown by our men on the "production front." These men are blazing new trails of tradition — setting up new standards of co-operation and hard work, building the Industrial Fans, Blowers, Unit Heaters, Fluid Drives and Mechanical Draft Equipment that have to come before the guns and bullets, tanks, trucks, ships and planes can be produced in overwhelming quantities. Much of this same equipment is going into the offensive weapons of both Army and Navy, too. We are proud to be a part of the Arsenal of Democracy . . . proud, too, that American Blower men are WORKING with all their might and main for Victory.

MECH. DRAFT · AIR-CONDITIONING
AMERICAN BLOWER
FLUID DRIVES · DUST COLLECTORS

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
In Canada: CANADIAN SIROCCO COMPANY, LTD., Windsor, Ont.

Division of AMERICAN Radiator and "Standard" Sanitary Corporation

"E" We are proud that we of American Blower, through our efforts to produce quantities of vital equipment in the shortest possible time, have received the coveted Navy "E" Award for production.

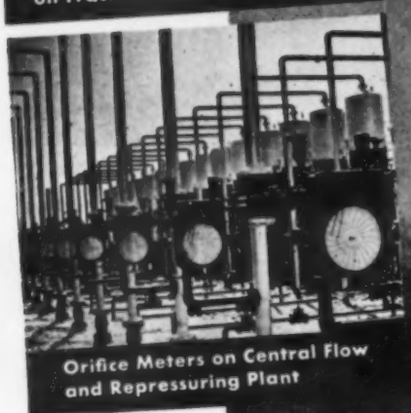
The key *to successful* repressuring

The modern way of oil and gas men is to drag even the "squeal" out of producer and reserve wells! And it works — when plant and field conditions and equipment conform strictly to the right engineering set-up.

Talk with the engineers and maintenance men. Learn why METRIC-AMERICAN Orifice Meters and Flow-meters are specified for so many of these ticklish jobs—where to be inaccurate or slipshod or fragile may put a dent in profits!

NOTE: Construction and design features of these dependable instruments are detailed in American Meter Company's engineering bulletins which will be mailed you upon request.

Flowmeters as Steam Indicators on Fractionating Stills



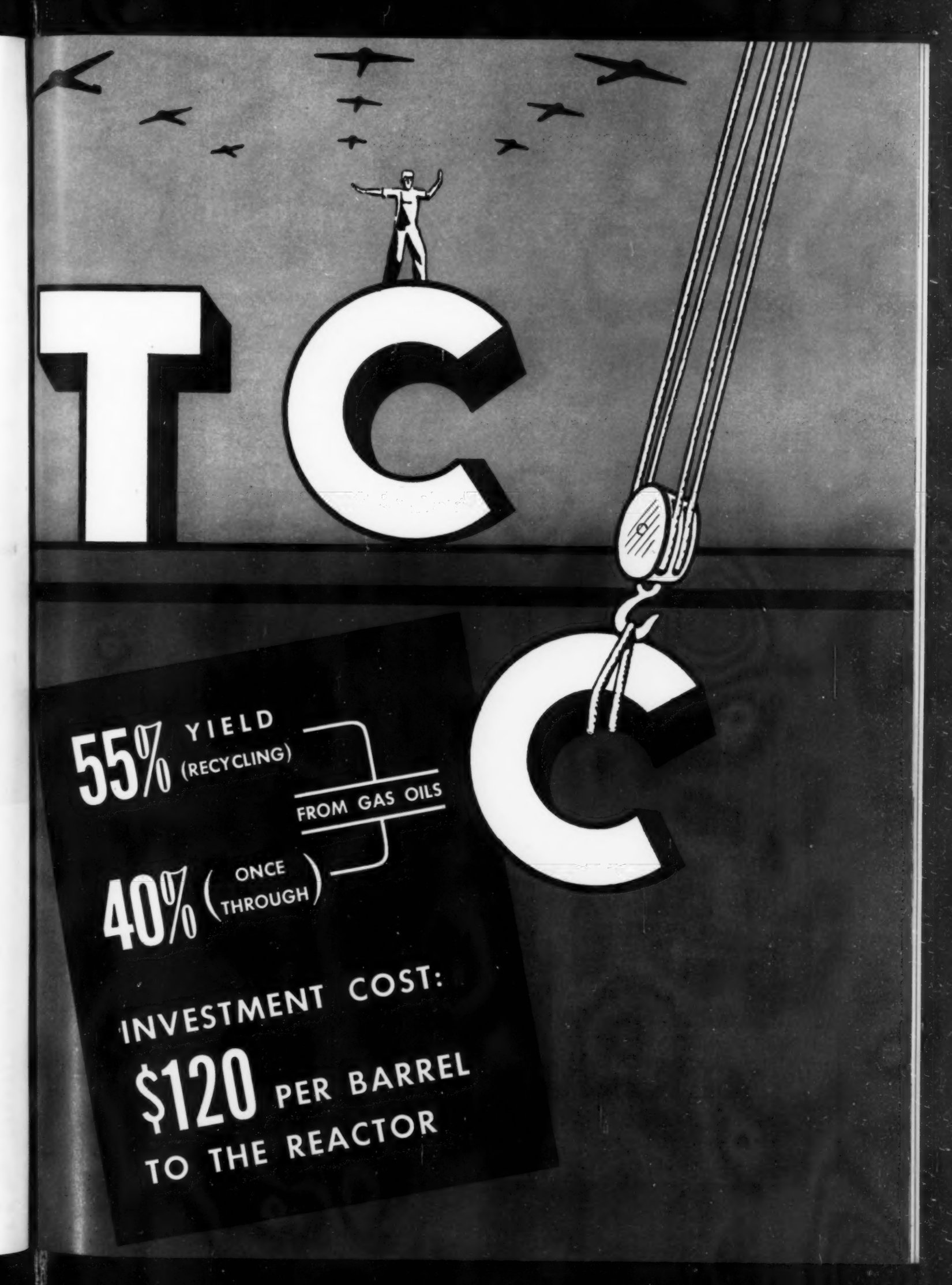
Orifice Meters on Central Flow and Repressuring Plant

Orifice Meter on High Pressure Well

METRIC METAL WORKS • ERIE, PA.

AMERICAN
METER COMPANY

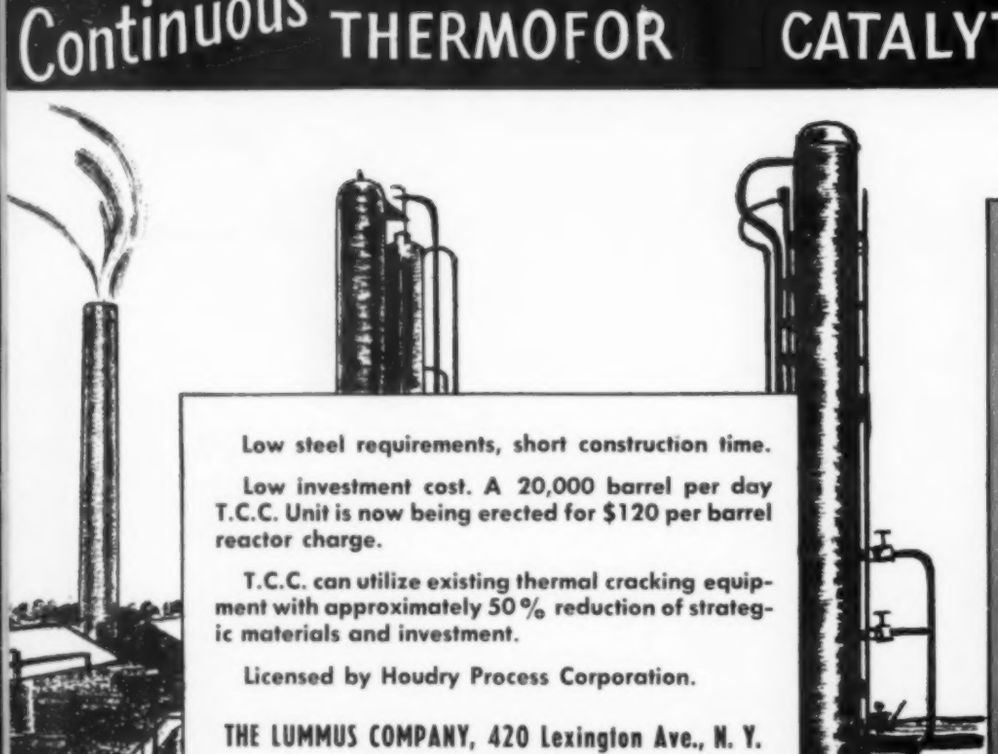
INCORPORATED ESTABLISHED 1836


TC
C
55% YIELD (RECYCLING)
FROM GAS OILS
40% (ONCE THROUGH)
INVESTMENT COST:
$120 PER BARREL
TO THE REACTOR

LOW IN INVESTMENT COST—
HIGH IN YIELDS

T.C.C.

Continuous THERMOFOR CATALYTIC CRACKING



Low steel requirements, short construction time.

Low investment cost. A 20,000 barrel per day T.C.C. Unit is now being erected for $120 per barrel reactor charge.

T.C.C. can utilize existing thermal cracking equipment with approximately 50% reduction of strategic materials and investment.

Licensed by Houdry Process Corporation.

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Economical Method of Producing

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★ BUTADIENE

★ TOLUOL

Butylenes (alkylate and butadiene production)

Iso-Butanes (alkylate)

Iso-Pentanes (100 octane)

Motor Gasoline

Solvents

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They're Lightweight

. . . and Built to Take It, too!

IN HACKNEY CYLINDERS light weight is perfectly balanced with adequate strength. As a result, you have a cylinder that is easier and faster to handle. At the same time, a Hackney Cylinder is designed for maximum strength—it assures your shipments the absolute protection they require.

A Hackney engineer can help you determine the most practical and economical cylinder for your individual needs. Write us today for complete information—there is no obligation.

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Hackney MILWAUKEE

CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

Announcing the

DU PONT ELECTROCHEMICALS DEPARTMENT

formerly

THE R. & H. CHEMICALS DEPARTMENT

With the same products... the same policies... the same personnel you have known in the past.

AS OF JUNE 1, 1942, The R. & H. Chemicals Department of Du Pont will be designated as the Du Pont Electrochemicals Department. This involves no change in the products you use, the policies you know or the people who serve you. The same experienced group of chemists, engineers and others will continue to further your interests through research, development, control, service and production. The development of new and better chemicals will remain a primary objective.

The products of the Electrochemicals Department will be, as before, a line of specialized chemicals derived principally from salt. In addition, it will continue to manufacture other specialties such as formaldehyde and its derivatives, polyvinyl alcohol, polyvinyl acetate, and ceramic colors and decorations.

The products of the Du Pont Electrochemicals Department are important in practically all branches of industry:

Chlorinated Solvents—for dry-cleaning, metal degreasing, extraction of oils and many other uses.

Peroxides—for bleaching, pharmaceutical and cosmetic preparations, general oxidation purposes.

Cyanides—for steel treating, electroplating, metal cleaning, fumigation, organic synthesis.

Refrigerants—for domestic and commercial refrigeration units.

Sodium, 99.9%—reactive chemical for industrial and laboratory work.

Formaldehyde and its Derivatives—for plastic manufacture; disinfecting; embalming fluid, treating paper, leather, textiles; chemical synthesis.

Electroplating Chemicals and Processes—for decorative and protective coatings on metal parts.

Ceramic Materials—for manufacture and decoration of glass, china, tile, terra cotta, porcelain.

Miscellaneous Chemicals—for Plating, Refrigeration, Plastics, Ceramics, Extermination, Rubber, Textile, Leather, Paper, Pharmaceutical and Process Industries.

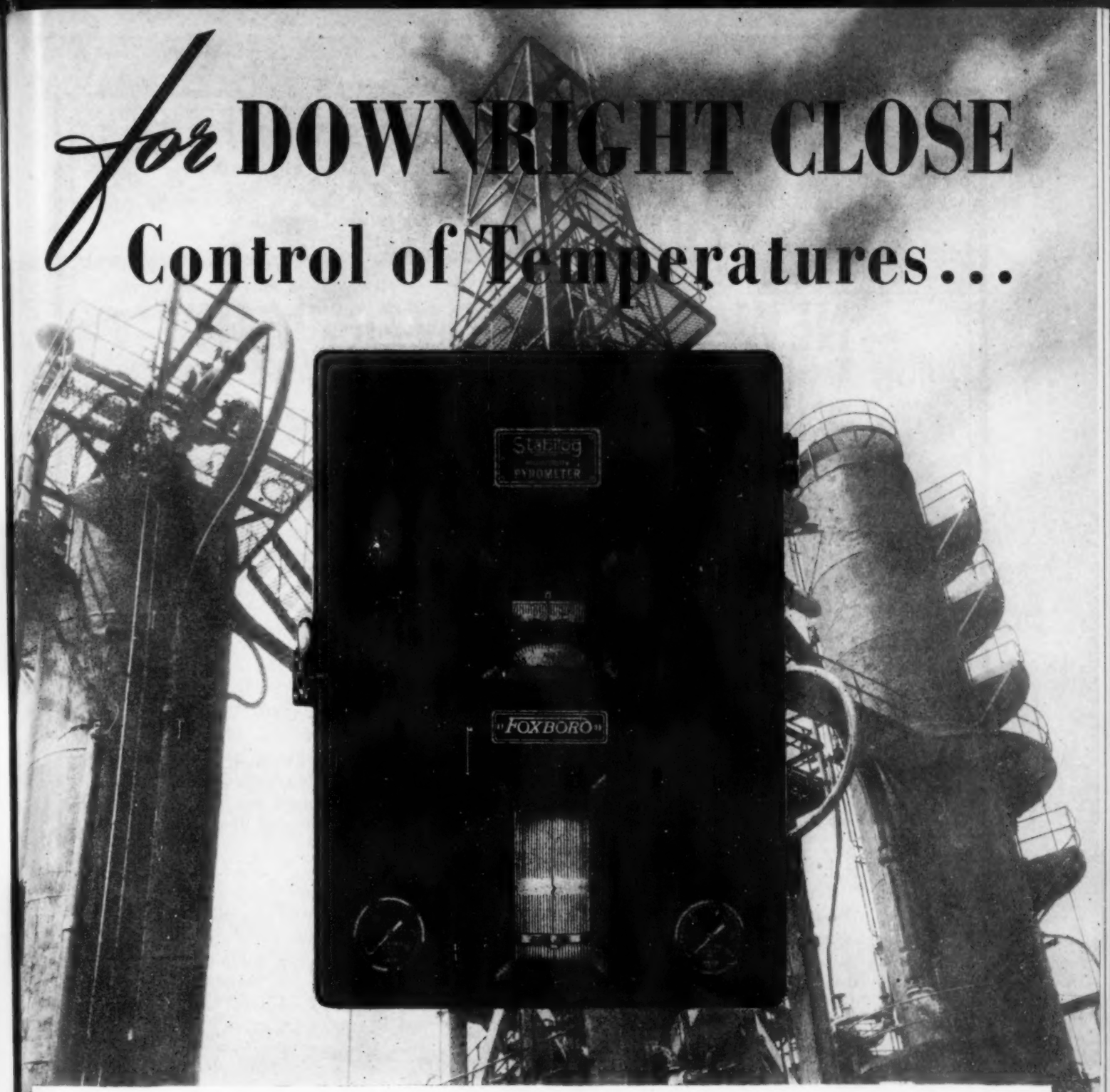
Our Technical Service will continue to cooperate with you in every way possible. You may find it even more helpful in today's emergency. Technically-trained men are at your service with the practical experience necessary to answer your questions on the use of specialties and specialized electrochemicals. They are ready to work with you in your plant or in our research laboratories.

DU PONT
REG. U. S. PAT. OFF.

Established 1802

E. I. du Pont de Nemours & Company, (Inc.)
Wilmington, Delaware

for DOWNRIGHT CLOSE Control of Temperatures...



Now . . . when every minute of the day must count for war production . . . why risk even occasional re-runs caused by temperature controllers that can't stop process-upsets fast enough?

Put a Foxboro "Pot. Stab." on your process and you'll eliminate those delayed-recoveries that steal production time and output. There's nothing else like it, for downright close control of temperatures!

Process men who have compared results will tell you that the Potentiometer Stabilog Controller is the "*best doggoned controller ever made*" for continuous processes. It's designed exclusively for superb control performance . . . without any cluttering complications.

All the accuracy of electrical measurement is combined with the control-flexibility of pneumatic-operation in the "Pot. Stab." Fixed setting of control point contact and unique detecting mechanism entirely eliminate dead space and result in positive valve action with the slightest change in temperature.

If you're looking for the best and most-dependable temperature control that instruments can give . . . write for full details of Potentiometer Stabilog Controllers. **The Foxboro Company, 16 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branches in principal cities.

FOXBORO

Reg. U. S. Pat. Off.

POTENTIOMETER STABILOG CONTROLLERS

YOU CAN'T GET A NEW BOILER OVERNIGHT

but you can increase the output of your present equipment without delay!

PERHAPS you may need new units to enable you to meet your peak demand. But it takes time to design, secure materials and erect new boilers —and time is short. So you are probably looking for ways and means of getting greater output from your present equipment.

One way of immediately improving your boiler operation is to use "Carbofrax"—the Carborundum Brand Silicon Carbide Super Refractory—in the clinker zone of the setting. Since "Carbofrax" brick do not soften at the high temperature encountered, clinkers do not build out on their hard dense face. Consequently, full grate capacity is assured and maximum steam production obtained. Moreover, eight to ten years of continued service is not unusual for "Carbofrax". And this longer life reduces refractory and labor costs, eliminates frequent and worrisome shutdowns for repairs due to lining failures.

Why not find out how "Carbofrax" can increase the efficiency of your boiler operation? We will be glad to assist you in making the application to your furnace. A letter or call to the nearest representative will bring a prompt response. A "Carbofrax" setting is a dependable setting.

REFRACTORY CARBORUNDUM PRODUCTS

THE CARBORUNDUM COMPANY, PERTH AMBOY, N. J.

REG. U. S. PAT. OFF.

Refractory Division

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

(Carborundum and Carbofrax are registered trade-marks of and indicate manufacture by The Carborundum Company)

ONE OR MORE OF THESE 5 CEMENTS

***Tegul-VITROBOND**
***Carbo-VITROBOND**
***KOREZ**
***Carbo-KOREZ**
ALKOR

Also **ATLAS ACID-PROOF BRICK**
***ATLAS RUBBER EXPANSION JOINTS**
***TRIPLE ACID-PROOF MEMBRANES**
***ATLAS DUAL CONSTRUCTION**
**Fully protected by patents*

WILL SOLVE YOUR ACID-PROOFING PROBLEM....
GET YOUR NEW UNITS INTO ACTIVE SERVICE IN A HURRY
...AND SAVE YOU MONEY AS WELL!

IF YOU NEED Units that will withstand the entire range of industrial corrosives • Correctly designed and properly constructed • And available for service without waste of time

THE ANSWER IS HERE ...In ATLAS ACID-PROOF CEMENTS and other Materials of Construction • ATLAS DESIGN, as used in the largest Chemical and Steel Plants • ATLAS SUPERVISED CONSTRUCTION, which avoids needless delays and costly errors

FOR EXAMPLE: TANKS—batch pickling; long continuous lines, as used in pickling steel strip; oversized units, for pickling heavy plate, as used in ship-building. STORAGE TANKS, CHEMICAL PROCESS EQUIPMENT, TOWERS, FLOORS, DRAINS, SEWERS, TANKS for CLEANING, PICKLING or PLATING of METALS...in fact, every type of unit which must resist

Nitric, Chromic, Sulphuric, Hydrochloric, Phosphoric or Hydrofluoric Acid; or Caustic Soda, Trichlorethylene, Toluene, Oils, Steam or Organic Solvents.

SIZE IMPOSES NO RESTRICTION and practically every industrial acid, alkali and solvent can be handled.

SETTING IS IMMEDIATE (with certain of these cements) and uniform throughout the mass—not faster on the surface and slower within. Laying acid-proof brick, as in tank linings, there is no waiting for one course to set before proceeding with the next.

ATLAS SERVICE IS COMPLETE. It includes Materials, Design, also Supervision of Construction, when desired. Responsibility thus centered leaves no room for alibis, as divided responsibility may well do.

•

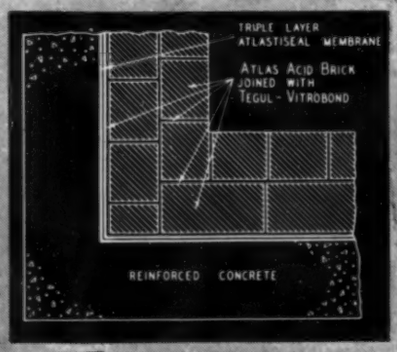
The Atlas Representative (address below) talks your language and can discuss your problem and help you solve it. Call him in. Meanwhile write us for Technical Bulletin No 2-C.

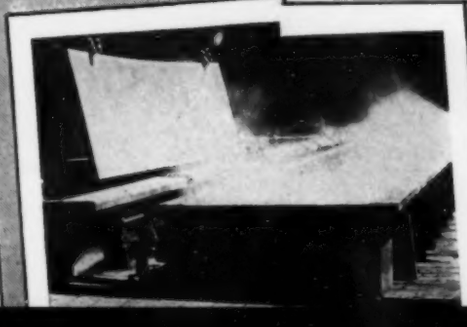
The ATLAS MINERAL Products Company OF PENNA.
Mertztown (The House Jointing Materials) **Pennsylvania**

***ATLANTA**, Ga. 175 Spring St., S.W.
***CHICAGO**, Ill. 333 No. Michigan Ave.
***DALLAS**, Tex. 3921 Purdue Street
***DETROIT**, Mich. 2970 W. Grand Blvd.
***KANSAS CITY**, Kan. 1913 Tauromee Ave.
NEW YORK CITY, 280 Madison Ave.
PITTSBURGH, Pa. (10) Old Boston Road
TORONTO, Ont., McRae Engineering Equipment, Ltd. 11 King St., West

The ATLAS MINERAL Products Company of California
REDWOOD CITY, California
***DENVER**, Colorado, 1921 Blake Street
***HONOLULU**, Hawaii, U.S.A.
Lewers and Cooke, Ltd.
***LOS ANGELES**, Cal., 817 Yale Street
***SEATTLE**, Wash., 1120 Eighth Ave. South

**Stocks carried at these points*

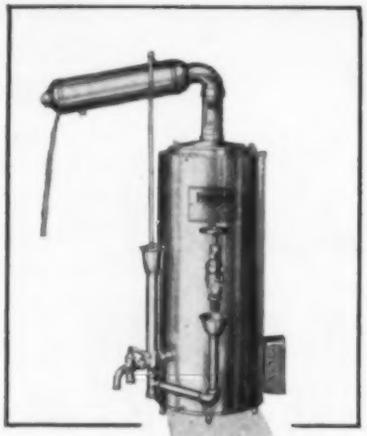




Upper left: Concrete Tank lined with Atlastiseal and brick joined with Tegul-VITROBOND (see cross section). Used for handling sulphuric and other acids.

Lower left: For the continuous pickling of steel. This is a typical Atlas installation. Ten tanks 60' x 4' x 4', and four tanks 25' x 4' x 4'—all lined with 8" of ATLAS Acid-proof Brick, joined with Tegul-VITROBOND.

Lower right: Tegul-VITROBOND-lined tank used by one of America's largest shipbuilders for pickling heavy plate. Two tanks, 42' x 5' x 11' deep; in service since 1936.

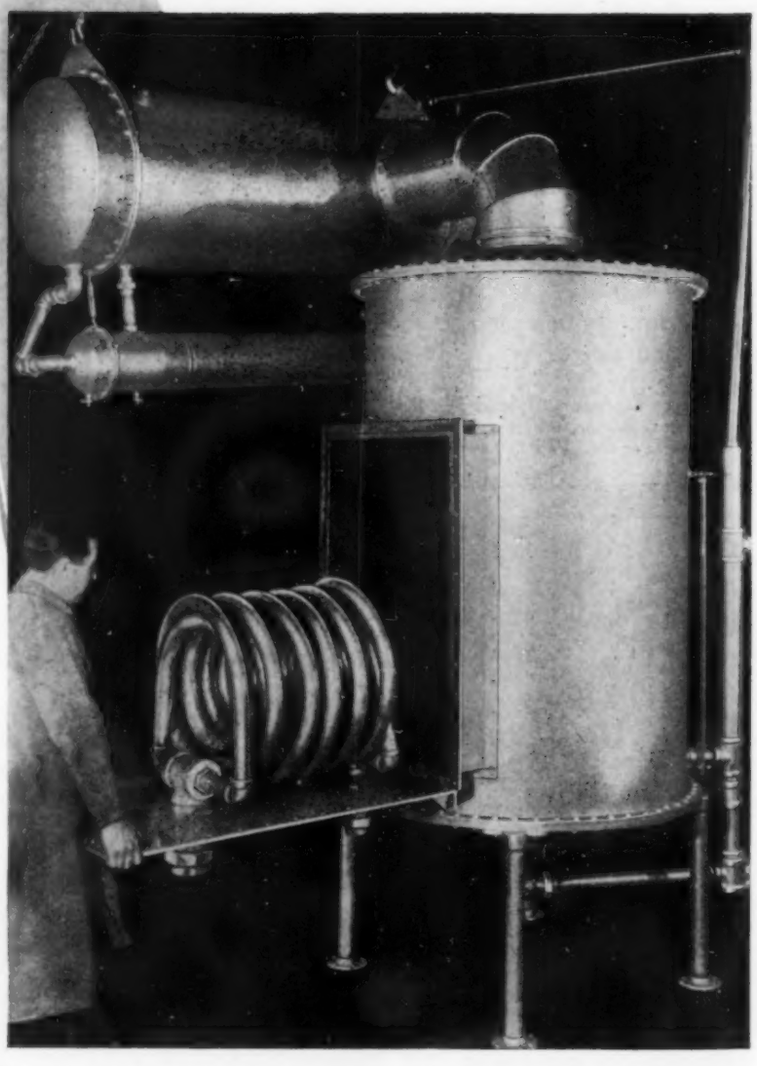


From ½ to 500 Gallons per Hour

BARNSTEAD WATER STILLS

Take any Barnstead Water Still — from the smallest ½ gallon per hour unit right up to the giant 500 gallon per hour model — and you'll find its distillate consistent with any other Barnstead Still. This is important. For it means that you can step up your supply of Barnstead Distilled Water by adding another Barnstead Still — and be absolutely sure of having no trouble with inconsistent degrees of purity. It also means that by using a Barnstead Still in your plant you can maintain the standards set by your research men who use a Barnstead in their lab.

Thousands of chemists use Barnstead Stills purely and simply because they produce the purest distillate at the lowest cost. Also because Barnstead steam, gas and electrically operated stills meet every requirement as to size, maintenance and operation.



Barnstead
STILL & STERILIZER CO. Inc.
4 Lanesville Terrace, Forest Hills, Mass.

A CHEMICO ACID PLANT *helps them do it*

Much high octane aviation gasoline . . . so necessary for stratosphere flights and universally used by military and commercial planes . . . is produced by processes which involve the application of sulphuric acid.

The recovery of waste acid sludge and the production of new acid afford important opportunities for economies in the refining cost of high octane gasoline . . . especially when produced by the alkylation process.

These economies are most fully realized by a CHEMICO acid production or recovery plant . . . for CHEMICO plants are designed and built by acid specialists with a background of 27 years of experience, and with unequalled resources and facilities.

Moreover, each CHEMICO plant is designed, erected, and guaranteed as a UNIT . . . with the CHEMICO organization accepting full responsibility for over-all satisfactory performance. Your inquiry is invited without obligation on your part.

CHEMICAL CONSTRUCTION CORPORATION

30 Rockefeller Plaza New York

Cables, Chemiconst, New York **European Representatives, Cyanamid Products, Berkhamsted, Herts., England**

CHEMICO PLANTS are PROFITABLE INVESTMENTS

COTTRELL PROCESS

of

ELECTRICAL PRECIPITATION

universally recognized as a
standard method of removing

DUST, FLY ASH, FUME, MIST & FOG

***from* GASES**

•

30 years of research development and operating experience by the affiliated Cottrell Companies throughout the world is incorporated in the

COTTRELL INSTALLATIONS

offered to meet the requirements
of any problem by

RESEARCH CORPORATION

405 LEXINGTON AVENUE
NEW YORK CITY

59 EAST VAN BUREN STREET
CHICAGO, ILL.

Trouble-free Motor Starters -no contact maintenance!

The three Kraft-Phenix Miracle Whip production lines, shown above, are controlled by eighteen Allen-Bradley combination starters. Several hundred A-B solenoid starters are used in the Kraft-Phenix plant on all types of food processing machines.

Motor control in this huge plant is trouble-free, because Allen-Bradley solenoid starters have no trouble-making gadgets. The solenoid construction does away with bearings, pins, pivots, hinges, and flexible jumpers. There is only one moving part. The patented A-B double-break, silver alloy contacts need no cleaning or attention. You install 'em and forget 'em.

Your plant can have similar trouble-free motor control. Just specify A-B solenoid starters . . . be safe . . . and save time.

Allen-Bradley Company

1337 S. First St. Milwaukee

Special Enclosures for the Process Industries

WATER-TIGHT
Nema Type 4. Water-tight and weather-proof. Zinc plated cast iron enclosure with live rubber gasket between cover and base.

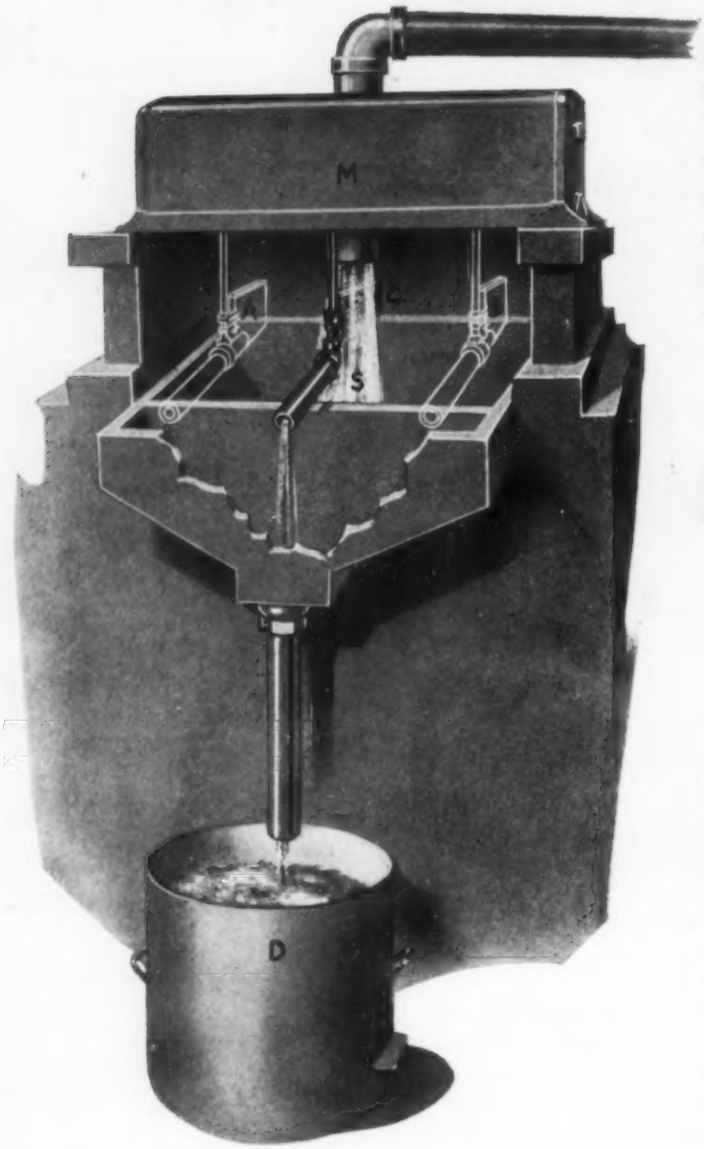
DUST-TIGHT
Nema Type 9 enclosure meets Underwriters' specifications for Class 2, Group G location in hazardous dusts.

HAZARDOUS LOCATIONS
Type G enclosure (Nema Type 7) for Class 1, Group D hazardous gas locations. Wide machined flanges.

CORROSION-PROOF
Type J enclosure with switching mechanism completely immersed in oil. Zinc plated cast iron.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

It Tells You The Truth!



Cutter "C" remains stationary, out of the stream, in Position "A," until Mechanism "M" operates and moves cutter across Stream "S" into Position "B." In traveling across the stream, Cutter "C" removes, or "cuts" a complete cross-sectional slice (the whole of the stream), which constitutes one sample. This is deflected through the cutter as shown above, and collected in any suitable manner at "D." Cutter remains at rest, in Position "B," until Mechanism "M" again operates, moving cutter back into Position "A."

If the materials you work with are important, correct sampling is imperative. Even slight error in the sample can lead to vast miscalculation in the mass. And that, in turn, can involve great loss. Hence the importance to industry of the proved and practical method of the

GEARY-JENNINGS *Automatic Sampler*

A cross section of the famous Geary-Jennings Sampler, shown at the left, reveals the simple and correct principle of its operation. Note that the cutter moves through the stream in a straight line, taking a sample of the WHOLE of the stream at accurately timed intervals and uniform speed. It works automatically, entirely free from human error.

GEARY-JENNINGS Samplers are made in various lengths of horizontal travel and with slots to accommodate various widths of stream and types of material to be sampled. Can be used as single unit or in group operation.

Our Bulletin No. 411, profusely illustrated with half-tones and diagrams, gives full details. Send for a copy today.

"THERE IS NO SUBSTITUTE FOR EXPERIENCE AND SERVICE"

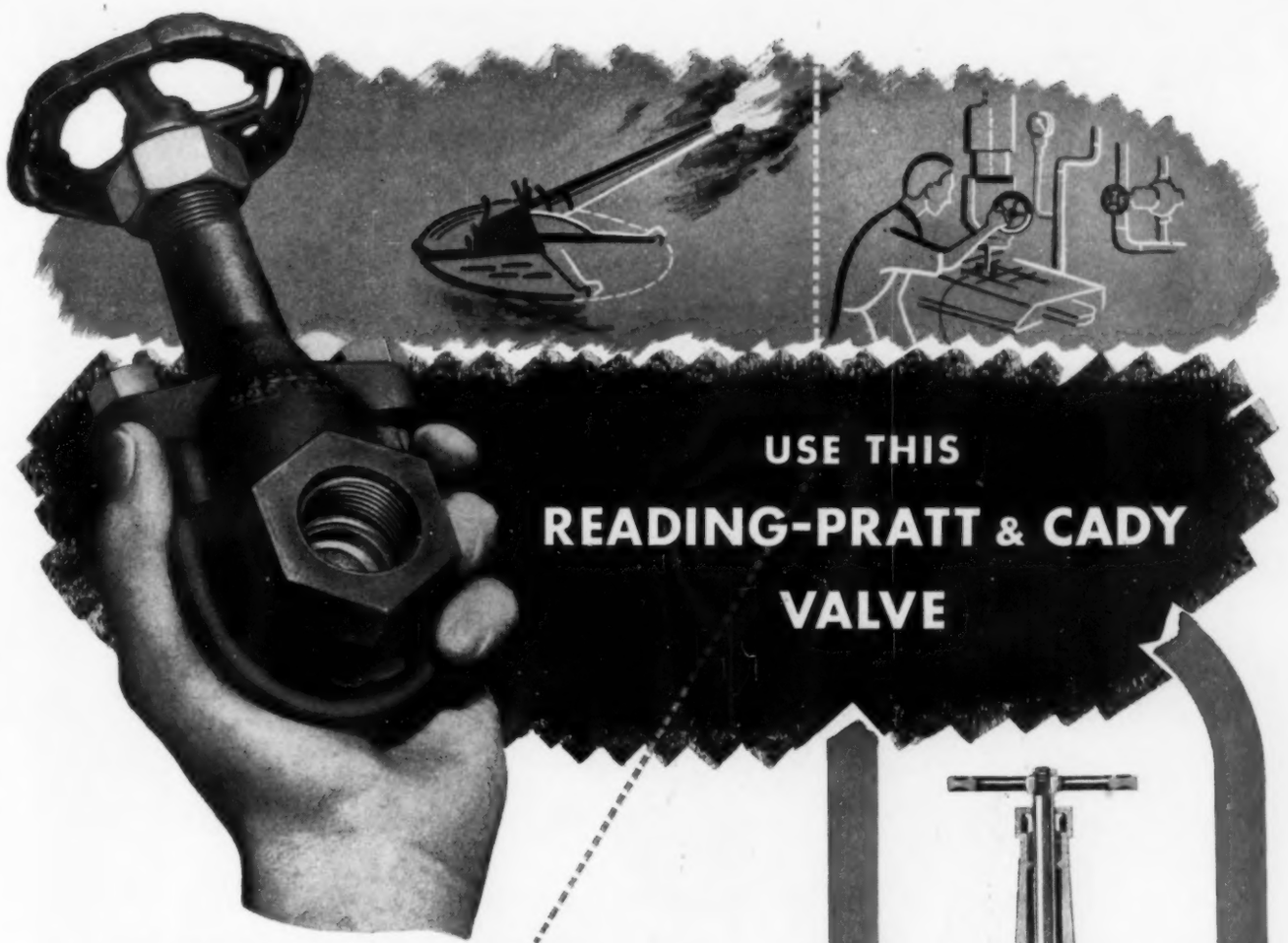
THE GALIGHER COMPANY

ORE TESTING LABORATORIES

British Mining Supply Co. Ltd. (Pty.)
Johannesburg, So. Africa

Established 1901

Metallurgical Division
228 So. West Temple,
Salt Lake City, Utah



USE THIS READING-PRATT & CADY VALVE

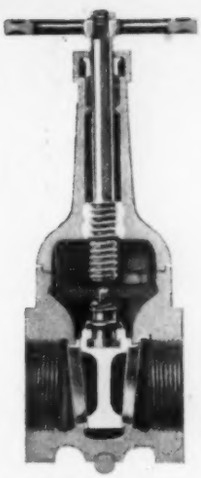
AS PART OF YOUR PROGRAM TO SWING TO ALTERNATIVE MATERIALS FOR THE DURATION

Wherever you need Clip Gate Valves of any size—*even smaller sizes*—turn your thoughts away from bronze bodies. The increasing war tempo has placed the supply of brass and bronze in an even more critical position.

You will be much more likely to get delivery if you use, as an alternative, valves with bodies of P&C High Test Iron.

If bronze trim is imperative, the spindle will be of P&C High Tensile Rolled Bronze. The Follower, cast-in bonnet bushing, renewable seat rings and reversible I-beam wedge will be P&C Special Valve Bronze. That sounds like a great deal of critical material. Actually, it represents scarcely ¼ of the total weight of the valve.

Bear in mind, of course, that, even where it is possible to obtain release of materials for you, deliveries are subject to the fact that in this plant the needs of America's Army and Navy—and those working directly on war production, have first call. We are doing everything within our power as manufacturers of valves and fittings to speed the day when Victory brings Peace.



P&C Figure 122-C
Iron Body Clip Gate Valve

Bronze mounted and all iron. Working pressures; 150 lbs. of steam; 225 lbs. OWG. Sizes; ¼" to 3".

Note the round bonnet which permits use of male and female bonnet joint with asbestos gasket and which assures tightness. Full U-Bolt equalizes pressure on both sides. Body guide lugs and closed bonnet eye-lugs prevent slippage. Heavy I-beam wedge. Full size body guides for wedge. P&C assembly of spindle and wedge provides great strength. Bonnet bushing is cast in.

READING-PRATT & CADY

Reading, Pa., Atlanta, Boston, Chicago, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco

A Division of AMERICAN CHAIN & CABLE COMPANY, INC. Bridgeport, Conn.

Helpful "Staff Work"

IN THE BATTLE OF PRODUCTION

All over America, engineers and production men are converting plants to war needs. These men know they can... upon request... get helpful suggestions from us about ways to speed up the working of metals and alloys.

This helpful information has been mobilized into convenient charts, pamphlets and other printed pieces. These tools-in-type range from technical data for engineers to simplified reports on performance of alloys containing Nickel under specific operating conditions.

Here, also, are correlated latest reports from the field about selection, fabrication and uses of ferrous and non-ferrous Nickel Alloys.

And, as further support for your battle of production, we offer personal assistance from members of our technical staff. With recent experience in many plants facing materials difficulties, these men become especially helpful. During wartime, Nickel... and information about Nickel... must go where it best serves the United Nations.

☆ ☆ *Nickel*

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

WAR *makes it vital to specify Atmospheric Cooling Towers today!**

YOU GET—3 TIMES FASTER COOLING TOWER DELIVERY

THE NATION GAINS*—COUNTLESS MAN HOURS AND TONS OF CRITICAL MATERIALS

Fluor Builds All Types of Cooling Towers

Fluor manufactures both Mechanical Draft types *and* Atmospheric Aerator Cooling Towers. We hold no brief for *either* type, recognizing only the fact that each type has its own, well-defined field of application. However, in recent years, a largely "*fashionable*" trend has developed toward Mechanical Draft types to the extent that, in approximately 75% of the cases where Mechanical Draft types are being installed, Atmospheric Cooling Towers could have been specified, rendering identical service with identical thermal efficiencies. Under WAR conditions, in the interest of its WINNING, we recommend that specifications be drawn on *fact* rather than *fashion* and, to this end, we offer the services of our engineers who will analyze your specific requirements and submit a recommendation based not on bias but strictly on tower efficiency for the job to be done.

When Atmospheric Cooling Towers are Specified You Make *Vital* War-Time Savings*

The *correct* specification of Atmospheric Cooling Towers in these 3 out of 4 cases will save a substantial percentage of the prime labor required for tower assembly and the secondary labor required for the manufacture of fans, gears, motors, switches, flexible couplings and electric wiring, *as well as the critical materials from which that equipment is made!* In tower operation you will conserve badly needed electric power, gaining at the same time, definite tower operating economies. All these things—man hours, machine hours, critical materials, power and energy— are definite deposits to the account of Victory!

IN 3 CASES OUT OF 4

A FLUOR ATMOSPHERIC AERATOR COOLING TOWER RENDERS SERVICE AND THERMAL EFFICIENCIES IDENTICAL WITH THOSE OF MECHANICAL DRAFT TOWERS...

Atmospheric Deliveries are Three Times Faster

Here is an added advantage—Atmospheric Cooling Tower delivery is 3 times faster than delivery of Mechanical Draft types! This is possible because only Fluor prefabricates and delivers from stock. There is no waiting for delivery of fans, gears, motors, etc. from sub-manufacturers. Prefabrication, product of Fluor standardization, likewise saves erection time and field crews are stationed near your plant ready to erect your tower and place it in operation in the shortest possible time.

*

Get the Facts on Savings Possible

Recently Fluor made a survey comparing the amount of critical materials, man hours, equipment and power energy required for a Mechanical Draft Tower and an Atmospheric Tower of identical capacity. This comparison shows the tremendous savings possible and the facts have been published in a special bulletin T-337. All concerned with the specification of cooling towers should have a copy, and yours will be air mailed immediately on request. *Send for it today!*

When to Specify Atmospheric Cooling Towers

Atmospheric Cooling Towers should be specified in all instances except those where space or sub-normal wind conditions make the use of Mechanical Draft Towers imperative. Fluor engineers will gladly survey your needs and recommend the *proper type* tower for your specific needs. Remember, when considering installation of a Cooling Tower, a good basic rule is—*Be Sure With Fluor!*

These views show Prefabrication in our Mill and a Portion of Prefabricated Stock ready for shipment from storage.

SINCE 1890

THE COOLING TOWER DIVISION OF THE FLUOR CORPORATION LTD.

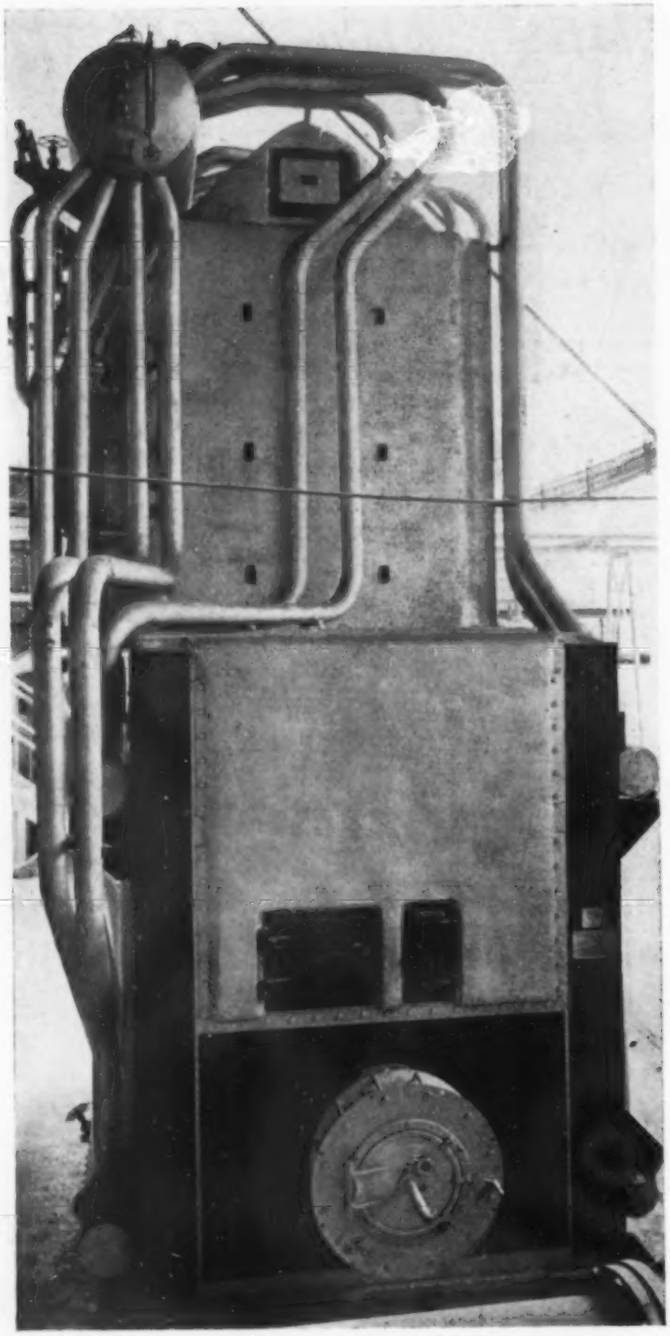
2500 South Atlantic Boulevard, Los Angeles, Calif.

NEW YORK • PITTSBURGH • KANSAS CITY • HOUSTON

FLUOR COOLING TOWERS

ATMOSPHERIC AERATOR AND MECHANICAL DRAFT TYPES

WASTE HEAT BOILERS for SO_2 GASES



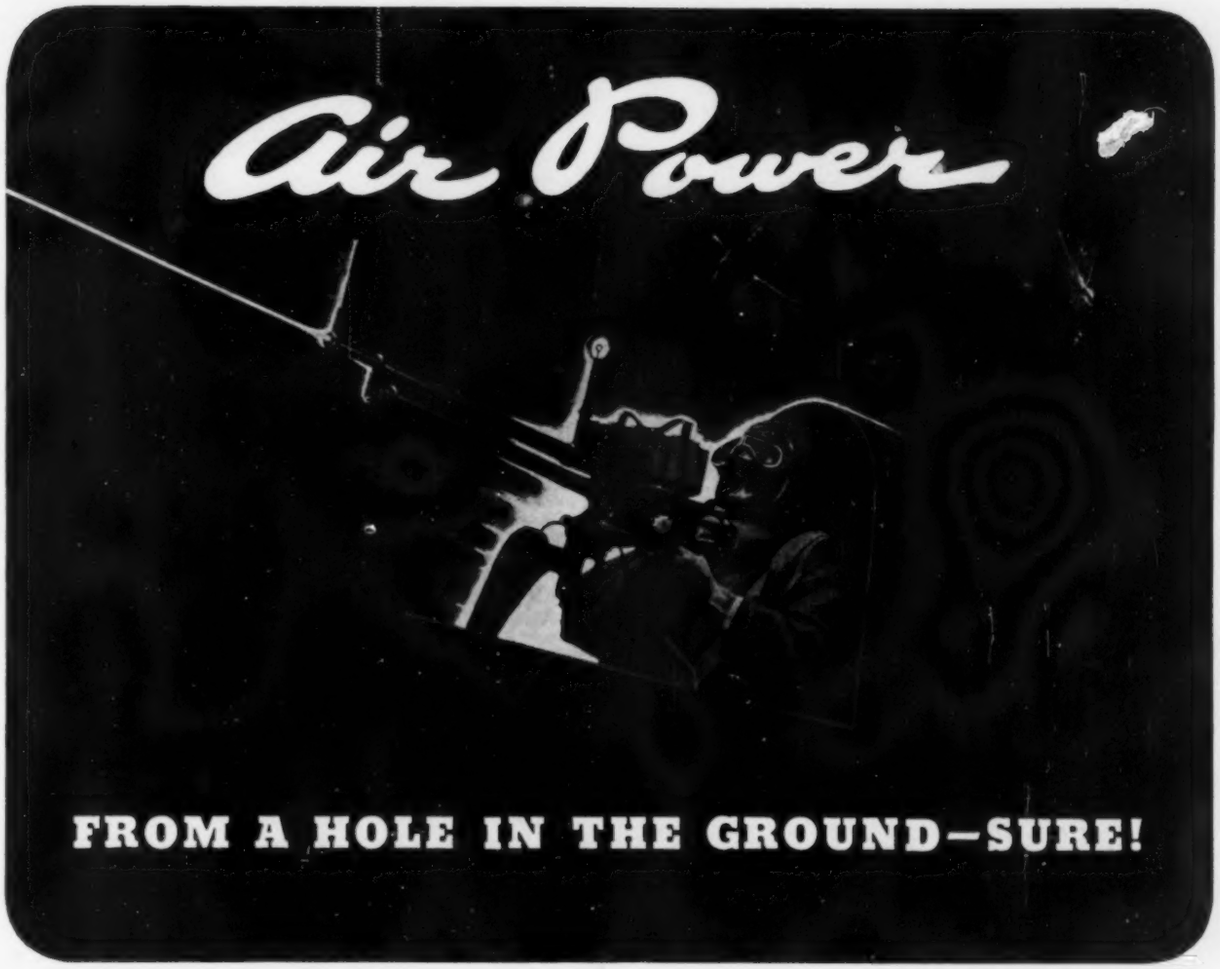
Combination sulfur burning furnace and waste heat boiler showing simplicity and compactness of design.

Approximately 300 Foster Wheeler waste heat boilers have been contracted for in this country and abroad since their development 14 years ago. Of these, 34 were for heat recovery from SO_2 gases. Twenty of these latter units have been placed in service during the past two years — indisputable evidence that the principle of heat recovery from SO_2 gases has proved economically advantageous.

Regardless of the source, the SO_2 gas generated in the manufacture of sulfuric acid must be cooled for further processing. By using waste heat boilers for this operation steam can be furnished—often sufficient for plant requirements—without additional fuel cost and the SO_2 processing improved. Cast iron extended surface rings shrunk upon seamless steel tubes were developed to eliminate the corrosive effects of sulfur-bearing gases. Only cast iron is exposed to the SO_2 gases and all joints are outside the gas passages.

FOSTER WHEELER CORPORATION, 165 Broadway, New York

FOSTER WHEELER



BENIFICIATION OF THE CRUDE ORE IS ITS SPRINGBOARD

★Bauxite, parent of aluminum for today's planes, is a far cry from the shining metal itself. Impurities and a low alumina content make benificiation of the crude ore a necessity.

This holds true of almost every raw material used by industry. Feather-weight aluminum and magnesium for planes. Tungsten, chromium, molybdenum and manganese for tool steel and armor plate. Cement—copper, nickel and zinc. The list reaches across all industry.

We cut our teeth years ago on the hydrometallurgical unit operations on which benificiation is based. Classification, Hydroseparation and Concentration are an old story to us. And we've used this accumulated knowledge to help us over the rough spots in handling all types of material—in solving all types of problems.

Today this experience is our backlog. A backlog that enables us to tackle new problems of benificiation with a sure hand and a certainty of solution.

★ ★ ★ ★ ★ ★

Rapidly shrinking imports and the terrific demands of war constitute a challenge to American Industry. Sources of raw materials hitherto never worth developing must now be worked to the limit. Benificiation at the raw end is providing suitable feed for war plants throughout all industry—enabling them to produce more—with less.

★ ★ ★ ★ ★ ★

DORRCO

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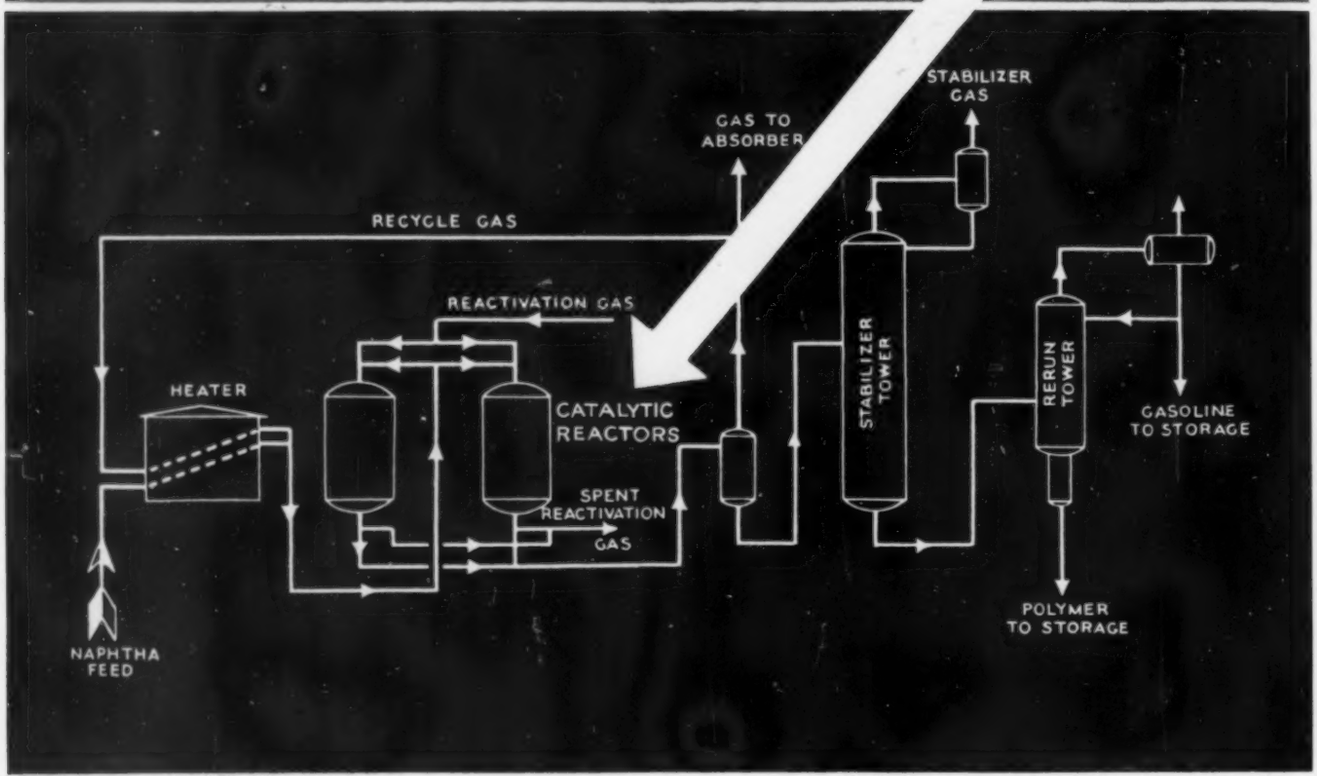
DORR

CONTINUOUS PROCESSING EQUIPMENT

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

ALUMINAS AT WORK HERE



Flow-chart by courtesy of *The Oil and Gas Journal*

Hydroforming unit employing Alumina catalysts

Aluminas are employed in the large-scale synthesis of high octane gasoline, so vital today for combat equipment. They serve in three ways: as catalysts, as carriers, and as auxiliary catalysts. They help to increase the yield, improve products, and reduce costs.

The physical properties of the Aluminas suit them for long use with a minimum loss of productive capacity in numerous catalytic applications. Their greater surface area increases the efficiency of the catalysts. When active catalysts are mounted on Alumina carriers, it is frequently possible to operate at lower temperatures.

Aluminas suitable for catalytic purposes are of two types. Activated Aluminas and the Hydrated Aluminas C-700 are catalytically active, and may be used alone or as catalyst supports. The inactive types are Tabular Alumina and Monohydrated Alumina D-50.

Whether you're building up or tearing down, Aluminas may give your catalytic reactions a boost. ALUMINUM COMPANY OF AMERICA (*Sales Agent for* ALUMINUM ORE COMPANY) 1910 Gulf Building, Pittsburgh, Pennsylvania.

Reg. U. S. ALORCO Pat. Off.

ALUMINUM ORE COMPANY

ALUMINUM AND FLUORINE COMPOUNDS

THE ONLY TURBINE OIL *GUARANTEED AGAINST EXCESSIVE ACID FORMATION

*HERE'S THE WRITTEN GUARANTEE YOU GET

"We GUARANTEE that Nonpareil Turbine Oil, Medium and Heavy, will last as long as your turbine where the lubrication system is thoroughly cleaned before this oil is put into use and where Nonpareil Turbine Oil, Medium or Heavy only, is used for replenishment, and where the temperature of the oil from the bearings is kept below 170°F.

"This guarantee has no time limit. If at any time, when the oil is operating under the above conditions, the neutralization number should rise higher than the extremely low limit of 0.15 when determined by A.S.T.M. Method D 188-27 T, we will cheerfully replace the oil without additional expense."

HERE'S WHAT THAT MEANS IN IMPROVED OPERATION

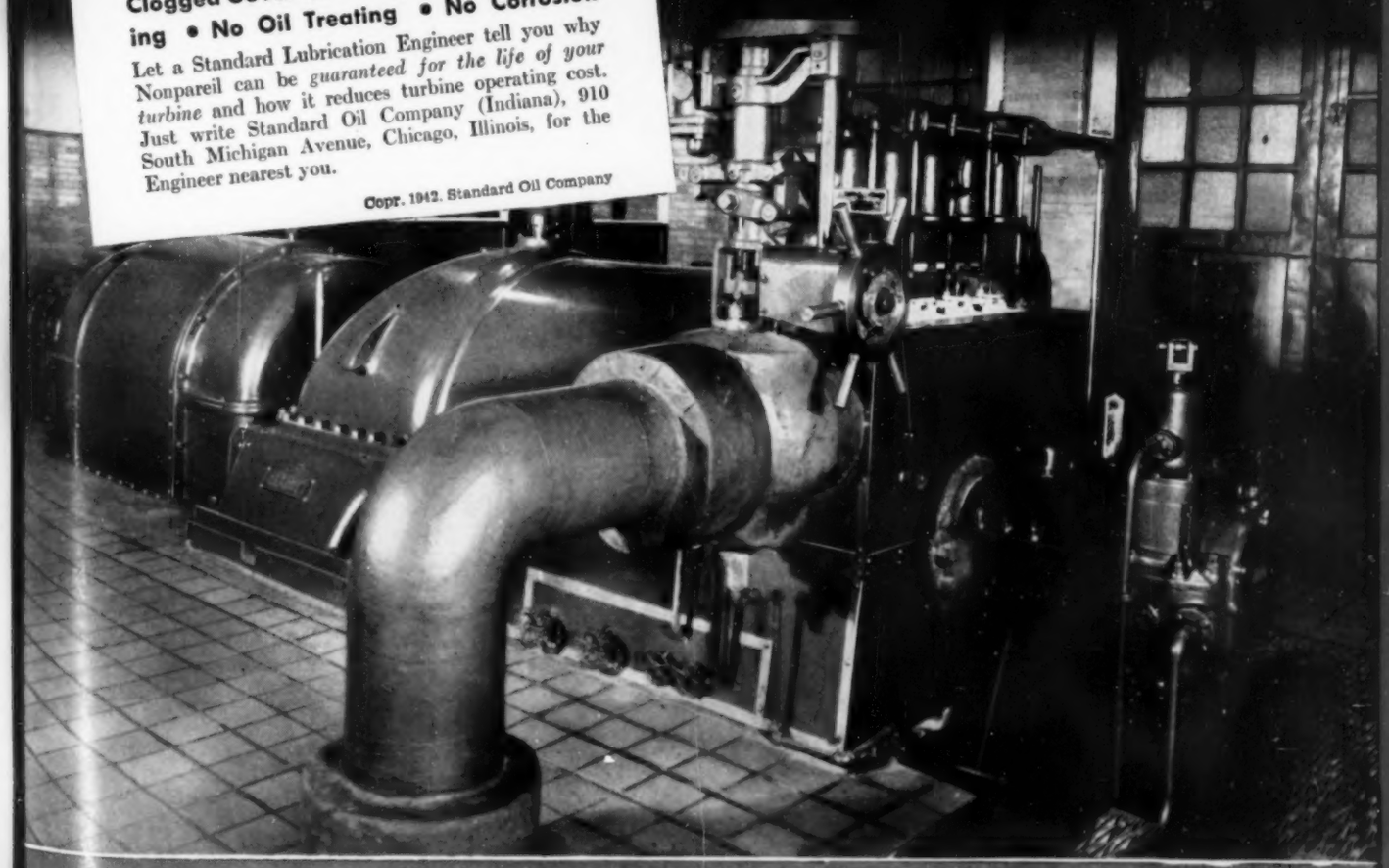
• No Oil Changes • No Sludge • No Clogged Governors • No Oil System Cleaning • No Oil Treating • No Corrosion

Let a Standard Lubrication Engineer tell you why Nonpareil can be *guaranteed for the life of your turbine* and how it reduces turbine operating cost. Just write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

Copr. 1942, Standard Oil Company

NONPAREIL TURBINE OIL

1. Stability Against Oxidation and Sludge.
2. Non-Corrosive. 3. Good Demulsibility.
4. Proper Viscosity Grades.



STANDARD OIL COMPANY (INDIANA)

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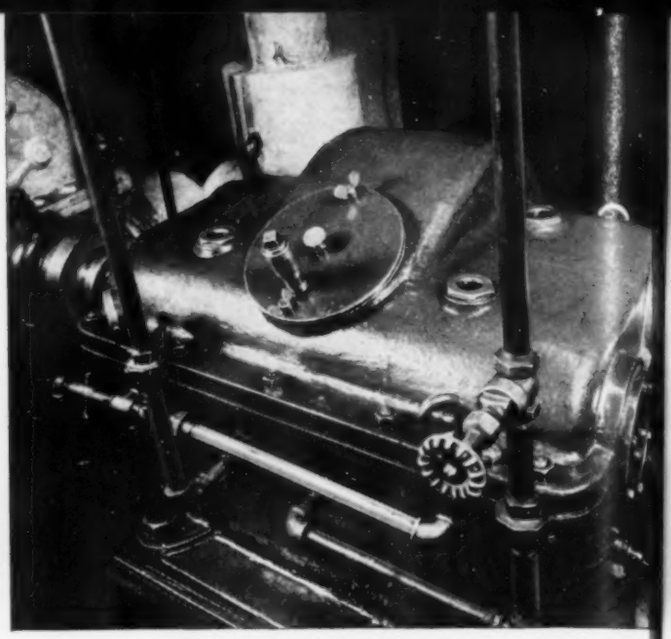
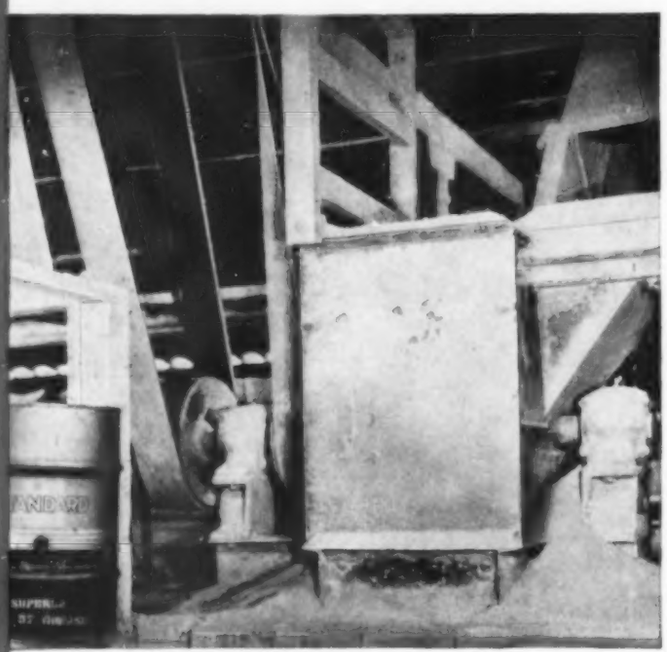
G...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRIC

ONE WAY TO AVOID BEARING REPLACEMENTS NOW... TRY CHANGING LUBRICANTS



● "KEEP OILERS ON THE RUN" was the superintendent's answer to high bearing maintenance costs caused by dusty conditions in a midwest fertilizer plant. It wasn't a happy answer. Crusher, conveyor, and other bearings were greased four times a day with consequent heavy costs for labor and grease.

The only answer seemed to be—redesign the bearings. At least, that's how matters stood when a Standard Lubrication Engineer was handed the problem.



His answer was higher quality grease—Superla. It kept dust out of the bearings, and greasing was needed only once a day. A bearing replacement became a thing of the past. The higher price was easily offset by the savings.

If you have any problem with bearings, see a Standard Oil Engineer before making any costly changes. There's one of them near you and he's ready to help you with your bearing or other machine operating problems.

OIL IS AMMUNITION

USE IT WISELY

CUT SHUTDOWN TIME FOR REDUCTION GEAR CARE WITH STANOIL

A North Dakota power company found it saved both time and money on the reduction gear pictured above. With a conventional oil, sludge formed in the units every three to six months. Then a fill of Stanoil was tried. It ran a full year before it was replaced. Even then, no deposits had formed and the oil was in good condition.

Savings in oil costs—just count them incidental, if you wish. But think of the production time you'd save if your reduction gears and oil circulating systems could be operated two to four times as long before they needed cleaning.

Discuss maintenance problems with a Standard Lubrication Engineer. See if he hasn't suggestions that will help you cut down lost machine time.

TO HELP YOU GET VICTORY PRODUCTION . . . .

As a means of conserving the machines and tools of industry so vital to Victory Production, Standard Oil Company (Indiana) urges plant officials to take advantage of the Lubrication Engineering Service that is available to all manufacturers in the Middle West.

Demands on equipment have been stepped up—lubricating requirements have changed. Lubricating problems similar to those in your plant may have been solved by these Engineers just a week or a month ago in other plants. You can have the advantage of their up-to-the-minute information on lubrication and lubricant developments at no cost to you. Just write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

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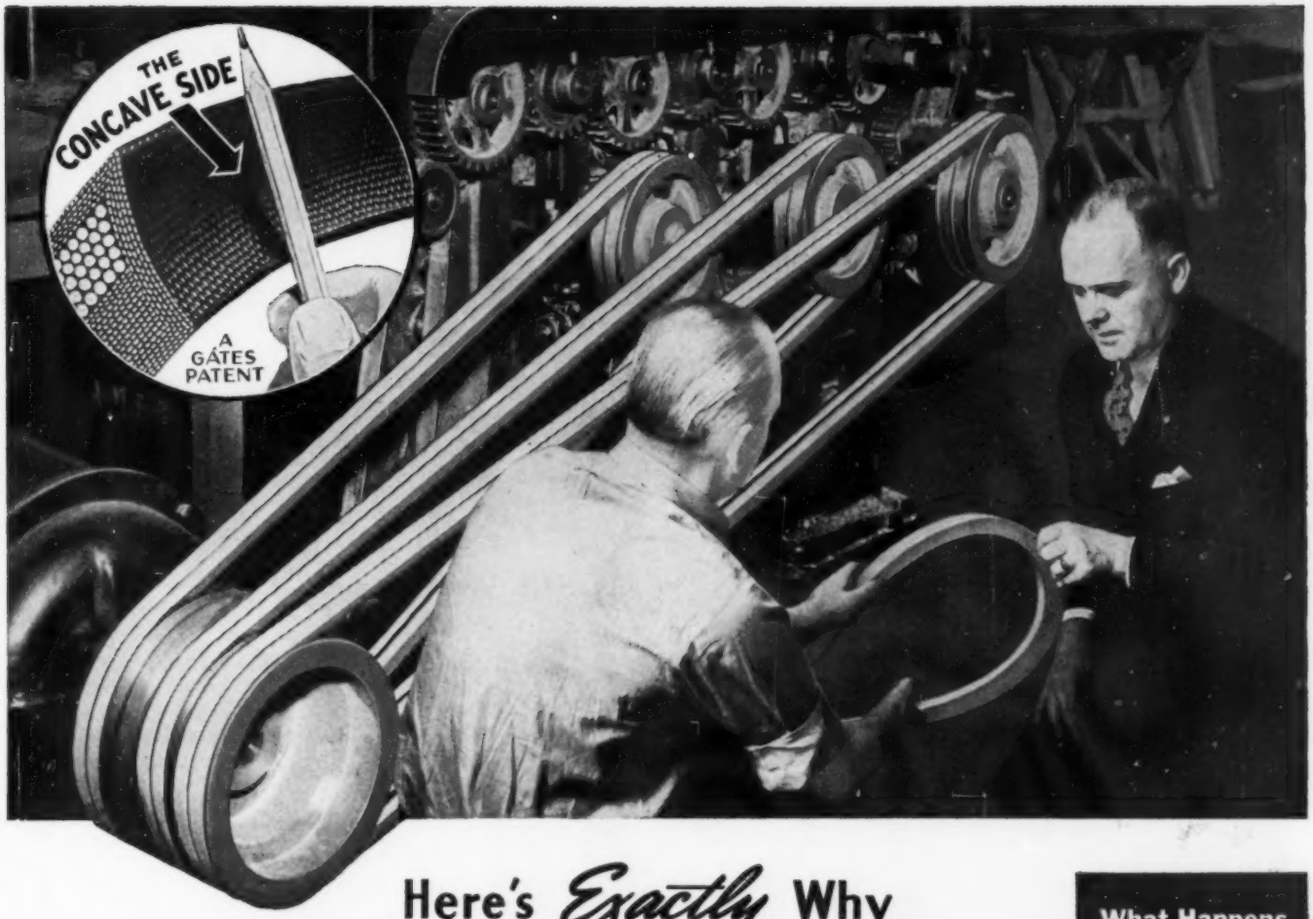


Here's *Exactly* Why

The CONCAVE SIDE

Saves Belts-Saves Rubber-Saves Power!

Pick up any V-belt that has straight sides. Bend that V-belt while you grip its side-walls as in the picture above. You will feel the sides of the belt bulge out —as shown in Figure 1 on the right. Clearly, that out-bulge gives the belt a shape that does not fit its sheave groove.

Now look at Figure 2. There you see what happens when you bend a belt that is built with the patented Concave sides. You get a similar change in side-wall shape—but what a different result! The precisely engineered Concave side becomes perfectly straight. There is no out-bulge:—the full side-width of the belt *uniformly* grips the sheave groove wall. This means *uniform* wear—*longer* life—a saving in belts for you, a saving in rubber for the Nation. In addition, this full side-width grip on the pulley carries heavier loads without slippage—another saving of belts and a saving in power too!

Only belts built by Gates are built with the Concave side, a Gates patent.

What Happens When a V-Belt Bends

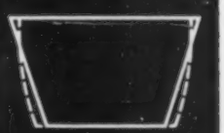


FIG. 1

FIG. 2

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

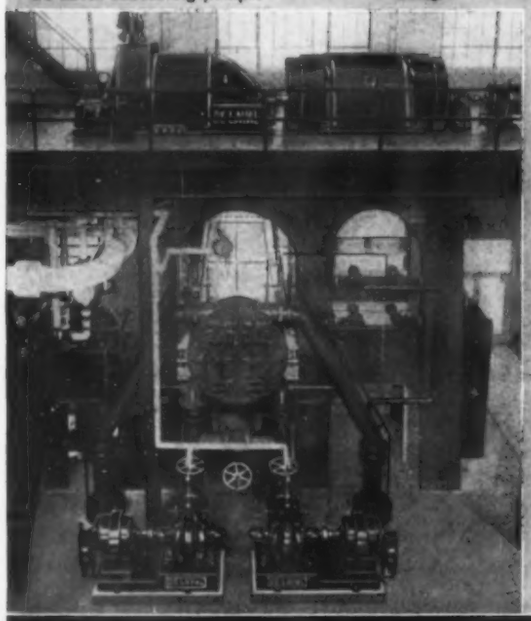
Chicago, Ill. 549 West Washington
New York City 215-219 Fourth Avenue
Birmingham, Ala. 405 Liberty National Life Bldg.
Los Angeles, Cal. 2240 East Washington Blvd.
Denver, Colo. 999 South Broadway
Dallas, Tex. 2213 Griffin Street
Portland, Ore. 333 N. W. 5th Avenue
San Francisco, Cal. 2700 16th Street

Efficient TURBO-ALTERNATORS

De Laval multistage impulse turbines specially designed for high economy with modern steam conditions and direct-coupled to alternators are now available in all capacities from 500 to 15,000 kw.

De Laval multistage turbine driving 4000 kw. (5000 kw. maximum) Crocker-Wheeler 60 cycle alternator in Wyandotte, Mich. Municipal power plant. The turbine receives steam at 425 psi. and 720° F. and exhausts to condenser. It is also arranged for bleeding at the 6th, 11th and 15th stages. A similar unit rated at 6000 kw. has since been ordered.

▼ Condenser installation, showing duplicate motor-driven De Laval circulating pumps.



WHEELS and shafts are of nickel steel, buckets and vanes of stainless steel and monel, and casings of cast molybdenum and carbon steels and molybdenum cast iron, according to steam temperatures.

Separation of water in the low pressure stages materially improves economy and reduces blade erosion.

Governing of admission valves is by two stages of hydraulic amplification from a sensitive and accurate fly-weight governor, with manual or remote synchronizing control. A separate throttle trip valve is operated by emergency stopping mechanism independently of the speed control.

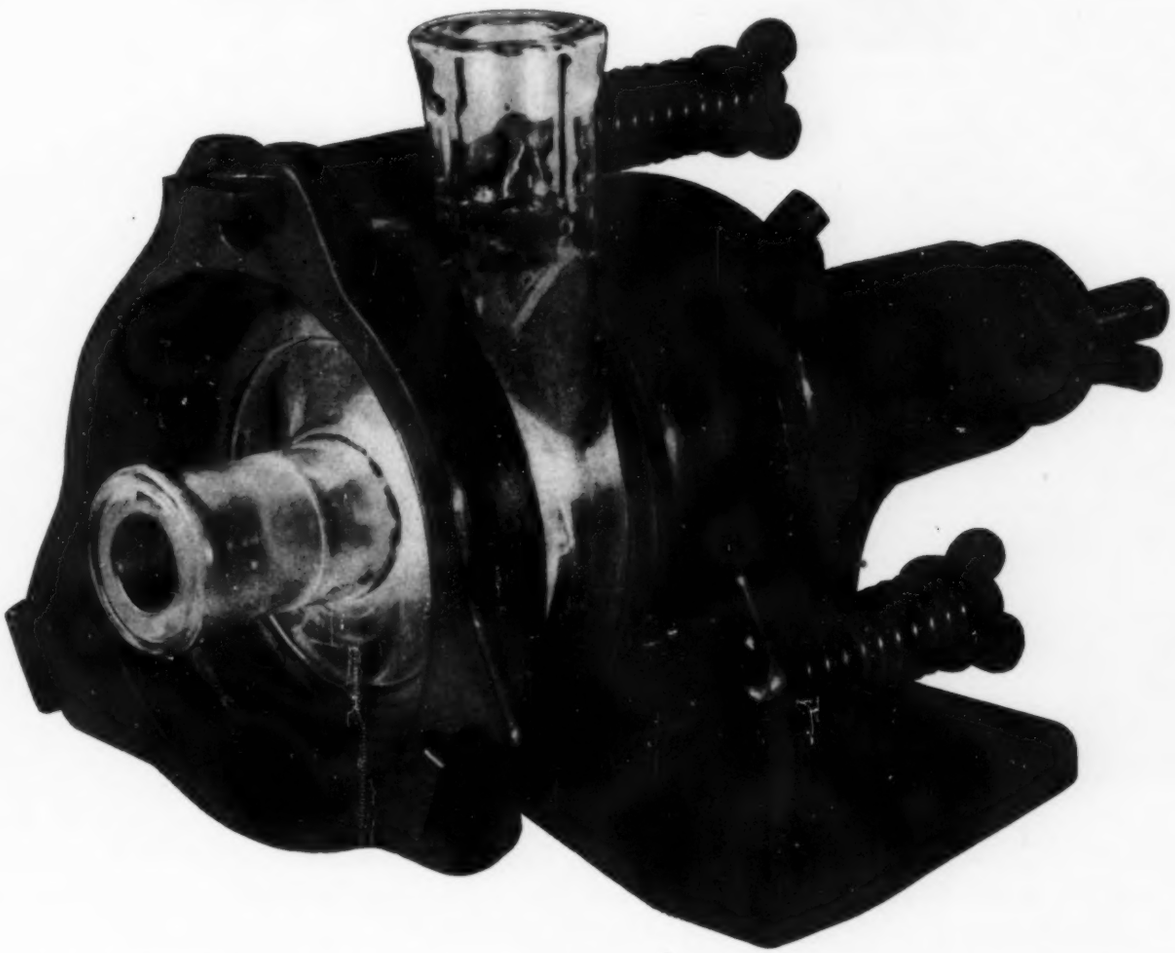
Ample bucket clearances and suitable casing supports permit quick starting.

For further details, see Leaflet T-3520.

DE LAVAL *Steam Turbine Co.*
TRENTON, N.J.

MANUFACTURERS OF TURBINES . . . STEAM, HYDRAULIC; PUMPS . . . CENTRIFUGAL, PROPELLER, ROTARY DISPLACEMENT, MOTOR-MOUNTED, MIXED-FLOW, CLOGLESS, SELF-PRIMING; CENTRIFUGAL BLOWERS and COMPRESSORS; GEARS . . . WORM, HELICAL and FLEXIBLE COUPLINGS

Nash Pumps of "PYREX" BRAND GLASS do the job and *Save Metal*



The Chemical Industries will find the new Nash Pumps of Glass particularly adaptable to the exacting liquid handling requirements of this field. Constructed of heat and shock resisting "PYREX" brand glass, they present a means of transferring not only corrosive acids, but any liquid chemical product which must be kept free from contamination.

All working parts of these centrifugals, including impeller and casing, are constructed of sparkling glass, with complete transparency, permitting constant inspection of product for color and condition. If pump needs cleaning it is immediately made visible, and the pump may be readily opened, cleaned, and reassembled. A unique mechanical seal replaces the conventional stuffing box, and a safety unloading device eliminates possibility of fracture of the glass casing should pump accidentally be subjected to excessive pressure. Hot acids and brine cooled liquids are handled with equal facility.

Nash Pumps of Glass are at present available in two sizes, a 6000 gallon per hour unit for large installations, and a unit with a capacity of 10 gallons per minute for small installations, and laboratory and pilot plant operation. Bulletins describing these sensational pumps in detail will be sent immediately upon request.

NASH ENGINEERING COMPANY

23 S. WILSON ROAD • SOUTH NORWALK, CONNECTICUT

Now is the Time to "SERVICE TEST"...

BRIDGEPORT DUPLEX TUBES

for Low Cost Protection Corrosion Control

In the process industries . . . in chemical plants, food factories, ammonia refrigeration systems . . . tubing installations often require a material or combination of materials that will withstand deteriorating or contaminating chemical reactions, both inside and outside. Bridgeport DUPLEX Tubes offset these conditions as they affect each tube wall surface by combining in one tube length an *inner* and *outer* wall of different materials, each selected for its ability to offset the particular condition encountered.

For example, DUPLEX Tubing can be made in such combinations as brass or copper with aluminum . . . cupro nickel, low carbon and stainless steel . . . and other metals and alloys with the special properties that will exactly meet the types and degree of corrosive or contaminating conditions affecting your plant and the efficiency of its operation.

Due to the national emergency it is, of course, impossible to produce DUPLEX Tubing quickly or in great quantity. However, experimental lengths of DUPLEX Tubing may be obtained from Bridgeport to service test and prove for future installation when normal production is resumed. Likewise, Bridgeport metallurgists and engineers are prepared to help you with your condenser and heat exchanger problems. There is no obligation, and many advantages in thus making sure condenser or heat exchanger tubes are . . .

"ENGINEERED TO YOUR SERVICE REQUIREMENTS"

BRIDGEPORT BRASS

BRIDGEPORT BRASS COMPANY • ESTABLISHED 1865 • BRIDGEPORT, CONN.

MARBLEHEAD

High Calcium Purity and Uniformity safeguard your CHEMICAL LIME processes against interruptions . . . help maintain fast, efficient, steady production . . .

MARBLEHEAD

High Calcium—High Quality CHEMICAL LIME

Industry's chief demand right now is *dependability*. When you ask of your chemical lime—"Will it do an efficient job for us without fail, today and every day"—you have the complete answer in Marblehead.

Because Marblehead has proven its ability to come through according to plan, by over 50 years of dependable service in every kind of lime-using process. It is consistently high in calcium, consistently low in impurities—consistently uniform in chemical energy.

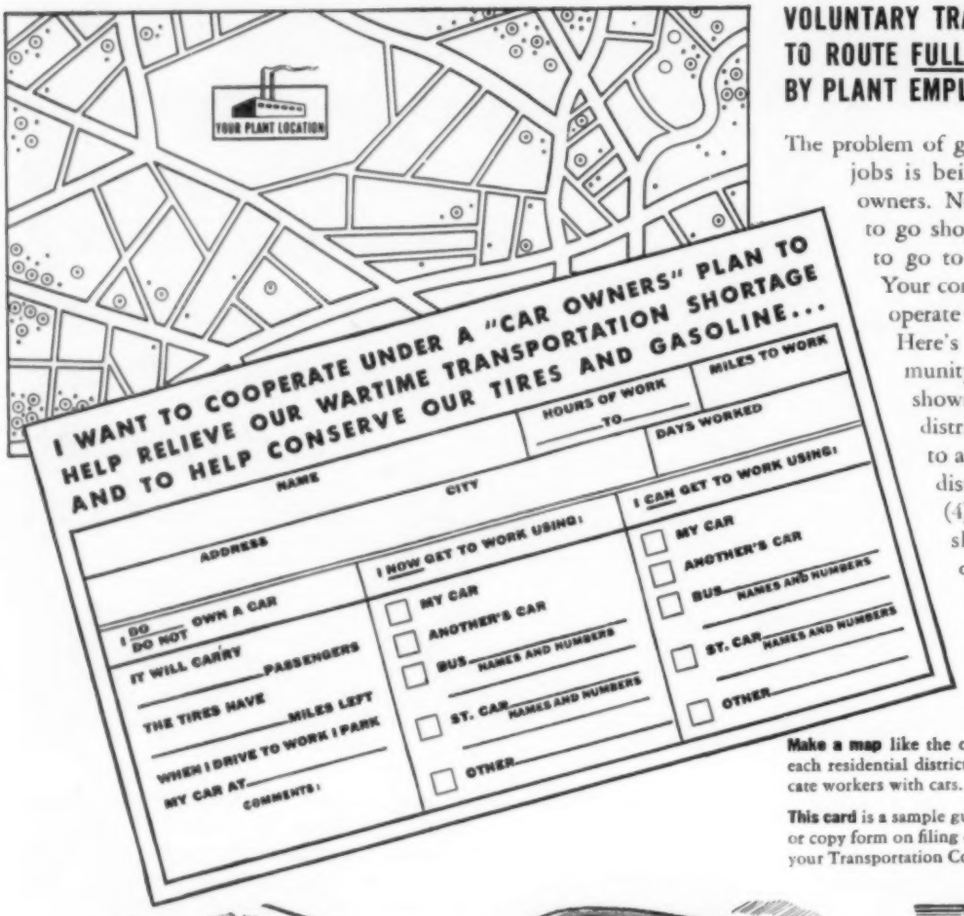
The reason is apparent. Extensive limestone deposits afford the choicest selection of rich, raw material, which is manufactured under strict technical control, with modern equipment, into a *true chemical product*. You automatically benefit from these outstanding advantages, when you buy Marblehead—in chemical qualities—in physical qualities—in steady, low-cost production. Booklet "Modern Chemical Lime," on request.

★ FOUR FORMS ★

MARBLEHEAD LIME CO.

160 N. LaSalle St. Chicago, Ill.

MANY LARGE COMPANIES ARE NOW TAKING A CENSUS OF EMPLOYEES' CARS AS PART OF NATION'S PROGRAM TO GET 40,000,000 WORKERS TO THEIR JOBS ON TIME


YOUR PLANT LOCATION
I WANT TO COOPERATE UNDER A "CAR OWNERS" PLAN TO HELP RELIEVE OUR WARTIME TRANSPORTATION SHORTAGE AND TO HELP CONSERVE OUR TIRES AND GASOLINE...
NAME
CITY
HOURS OF WORK
TO
MILES TO WORK
DAYS WORKED
ADDRESS
I DO / DO NOT OWN A CAR
IT WILL CARRY PASSENGERS
THE TIRES HAVE MILES LEFT
WHEN I DRIVE TO WORK I PARK
MY CAR AT
COMMENTS:
I NOW GET TO WORK USING:
MY CAR
ANOTHER'S CAR
BUS NAMES AND NUMBERS
ST. CAR NAMES AND NUMBERS
OTHER
I CAN GET TO WORK USING:
MY CAR
ANOTHER'S CAR
BUS NAMES AND NUMBERS
ST. CAR NAMES AND NUMBERS
OTHER

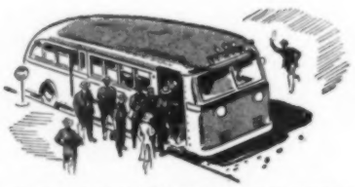
VOLUNTARY TRANSPORTATION COMMITTEES TO ROUTE FULL CARS TO WORK ARE SET UP BY PLANT EMPLOYEES IN EACH COMMUNITY

The problem of getting 40,000,000 workers to their jobs is being taken over by America's car owners. Neighbors are already doubling up to go shopping, to take children to school, to go to work . . . *but not enough of them!* Your company and your employees can cooperate by taking a census of workers' cars. Here's how you can do it in your community: (1) Fill out cards, like the one shown here, (2) Sort cards by residential districts, (3) Select sectional committees to act as traffic control groups for each district to assure equitable use of cars, (4) Route *full* cars to work on every shift. Details can be worked out quickly by you . . . your workers . . . your community. The important thing is to start today to get every last mile of use from our cars, our gas, our tires!

Make a map like the one above, on which to chart the routes for each residential district. Dots indicate workers' homes; circles indicate workers with cars.

This card is a sample guide. Make changes to suit your needs. Reprint or copy form on filing cards for each worker to fill out and turn in to your Transportation Committee.

Trolleys can't do it ALONE. Even with staggered work hours to level off transportation peaks there aren't enough trolleys to take America's millions to work.



Buses can't do it ALONE. They're already taxed to their full seating capacity. And enough vital steel and rubber can't be spared to build enough new buses.

Trains can't do it ALONE. Although every railroad is cooperating 100%, many of America's mighty war production plants can't be serviced by trains or subways.

HOW TO CONSERVE MECHANICAL RUBBER GOODS

This 48-page book is for managers, engineers and plant operating men. It shows how you can conserve rubber through proper handling, installation and care of rubber conveyor, elevator and transmission belts; all types of industrial hose; packings; linings; rolls; mountings; and other mechanical rubber goods; and electrical wires, cables, and tapes. For free copies, write directly to Mechanical Goods Division, United States Rubber Company.

GET FREE MILEAGE BUDGET CHARTS

and copies of this free 32-page book on tire care from your local U. S. Tire Dealer or write direct to the United States Rubber Company. Hundreds of thousands of these charts and books are already in the hands of American car owners — helping to save tires, gas and oil.

IN AMERICA'S FIGHT FOR LIFE, EVERY TIRE-MILE MUST BE SAVED FOR ESSENTIAL DRIVING

UNITED STATES RUBBER COMPANY

1230 Sixth Avenue • Rockefeller Center • New York

A MEMO FOR THE YEAR 1 A.V.*

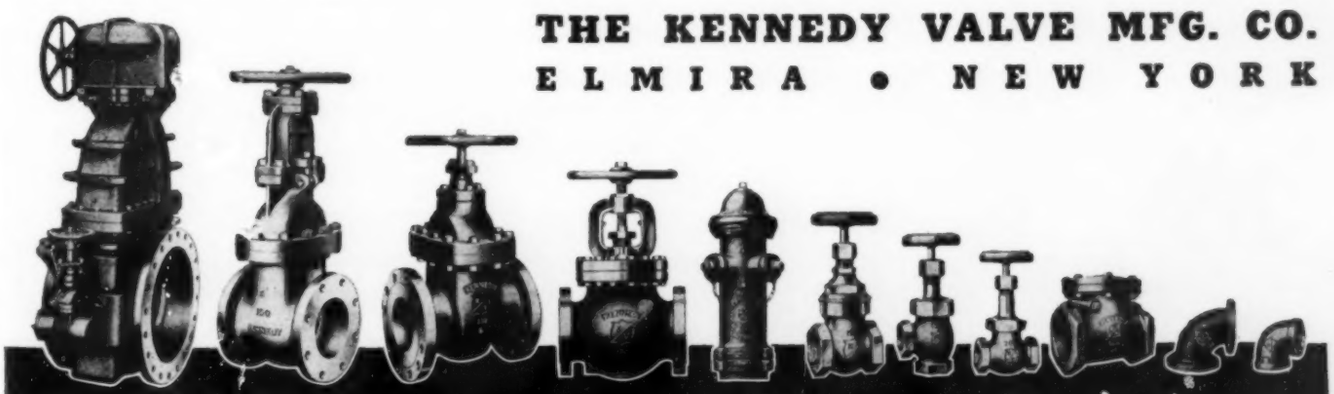
We must acknowledge the fact that during the present emergency it is difficult, if not impossible, to obtain equipment and supplies for any but war projects. However, the present situation will not last, and far-sighted plant managers and engineers are already planning for "The Year 1 A.V.*"

What do these plans include? Necessary replacements of equipment that is now being worn out at a rapid rate . . . readjustments to take care of regular commercial business that is now being subordinated to war requirements . . . expansions that may be required for new developments.

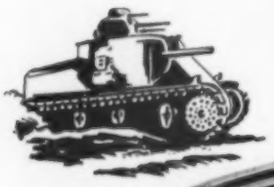
"In time of war, prepare for peace" . . . and those who plan now will be in the best position for necessary readjustments without loss of time. Kennedy can help you decide on the most suitable types of valves for any projected requirements of service, fluid, pressure and temperature. The authoritative advice of the Kennedy engineers is yours without charge or obligation. Why not start now to prepare for "The Year 1 A.V."

*"The Year 1 A.V."? To American industry it means "AFTER VICTORY"

THE KENNEDY VALVE MFG. CO.
ELMIRA • NEW YORK



KENNEDY *valves . . . pipe fittings . . . fire hydrants*



Vital LINKS for All-Out Production

MORSE

SILENT and ROLLER CHAIN DRIVES

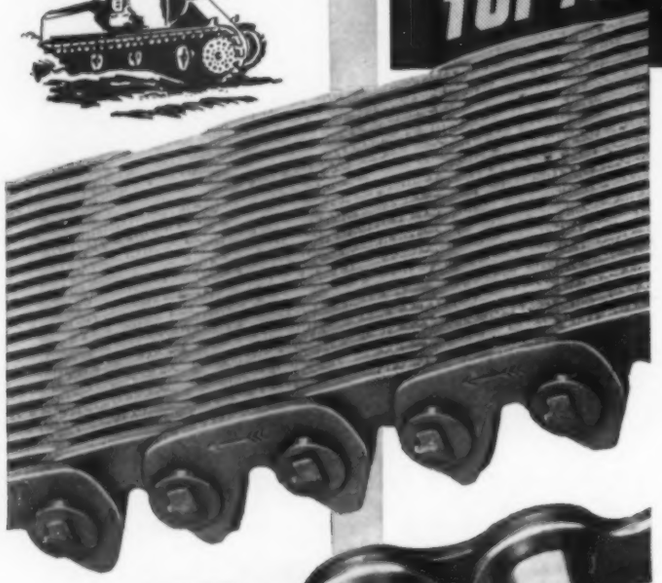
Meet Every Demand
No Slip—No Power Waste

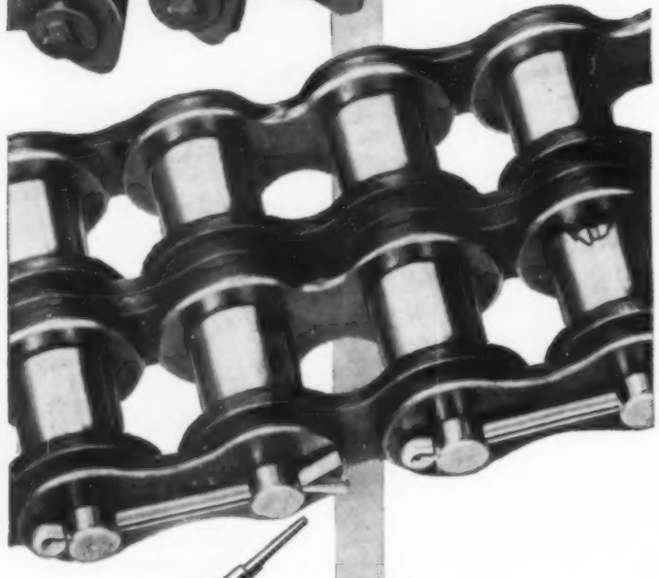
Power drives are vital in today's production rush. Beware of inefficient drives that cut down production through slippage and power waste.

Take advantage of Morse Silent and Roller Chain Drives. Their compact design, rugged construction and proven performance are your assurance of efficient power transmission and peak production. Smooth, dependable in operation, they set new records of trouble-free, economical service.

Morse Silent Chain Drives embody the famous patented "Rocker Joint" that rolls, not slips, the load—resulting in minimum resistance and wear for maximum efficiency and long life.

The Morse man in your territory will gladly assist in any of your drive problems—call him.





SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.

FORWARD-LOOKING executives find time, even under the pressure and strain of making every minute count for war production, to think of the post-war expansion that is inevitable. After final victory there will be a gigantic scramble on industry's part to return to peace-time production. There will be a demand for commodities such as the world has never seen, as the depletions of war are replenished with new and better products.

Industry might well learn a lesson from the intent behind the vast registration program, that of analyzing the nation's manpower. From this came the selection of men for training. Be in a position to select the location for your post-war expansion by getting the facts now about the Texas Gulf Coast's resources and advantages. Here are vast and varied resources available to industry. For fuel supply, The Houston Pipe Line Company has available enormous quantities of NATURAL GAS, gathered by the company's far-flung pipe line system, strategically located across the length and breadth of the Texas Gulf Coast. Now in the service of our country by dispatching never-failing supplies of NATURAL GAS to industries engaged in production of essential war materials, the post-war period will find us more than ever ready, willing and able to serve industry. Let our Research Department compile a confidential survey of this region's resources and advantages, individualized to your company's processes and products, so you'll have the facts upon which to base your selection. You obligate yourself in no way by this request. Just address Research Department, Houston Pipe Line Company, Petroleum Building, Houston, Texas.

For Victory Buy United States Savings Bonds

HOUSTON PIPE LINE CO.

Subsidiary of Houston Oil Company of Texas

GEO. A. HILL, JR., President

Wholesalers of Natural GAS

● Built by
J. M. LEHMANN CO., INC.

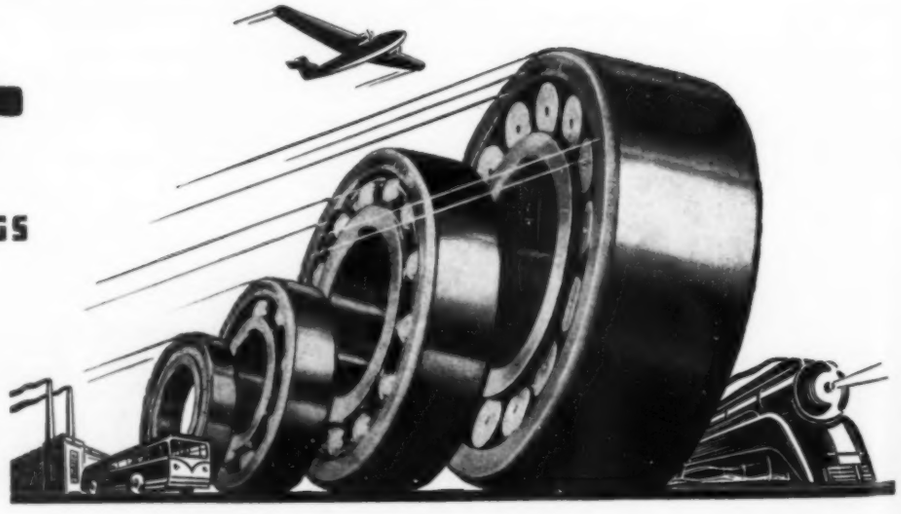
For Bearing Precision *on* SOAP MILLS

PRECISION is required as material is passed between the rollers of this Five Roller Soap Mill. The shaft centers must be accurately maintained, and the loads are heavy. You understand, then, why the bearings must be accurate and have full load carrying capacity at all times . . . why the bearings are SKF Spherical Roller Bearings. It's as true of this machine as of crushers, screens, and other husky machines upon which Production depends: It's no better than its bearings. 5052

SKF INDUSTRIES, INC., PHILA., PENNA.

SKF

BALL & ROLLER BEARINGS



IT'S EASY TO REGRIND THESE LUNKENHEIMER VALVES

with a few minutes effort they can be made as good as new

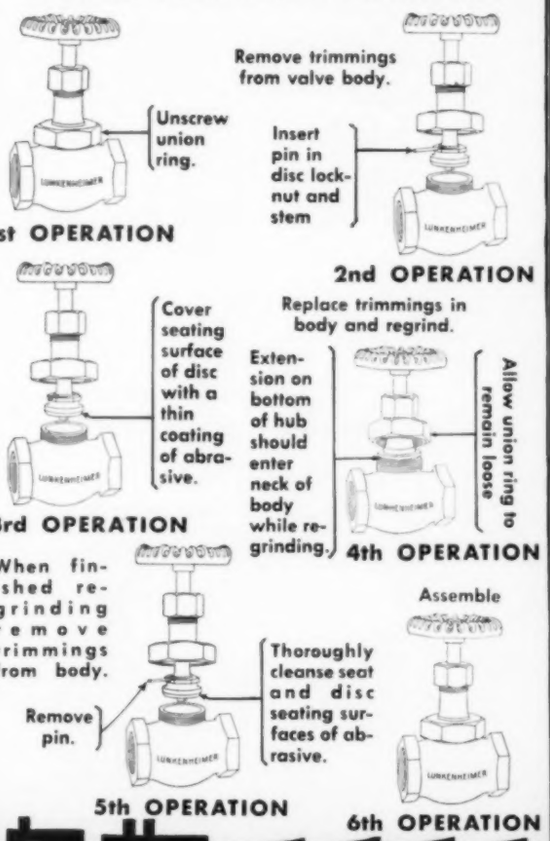
Valve regrinding is really a simple operation—it can be done so easily and quickly without taking the valve from the line.

And in this critical period when savings in maintenance time mean so much toward total production—even the time saved in the regrinding operation over replacement is of vital importance.

All parts of Lunkenheimer Regrinding Valves are renewable. Having a few parts available in stock for an emergency can also save much valuable time.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST. NEW YORK

INSTRUCTIONS FOR REGRINDING


Unscrew union ring.
1st OPERATION
Remove trimmings from valve body.
Insert pin in disc lock-nut and stem
2nd OPERATION
Cover seating surface of disc with a thin coating of abra-sive.
3rd OPERATION
Replace trimmings in body and regrind.
Exten-sion on bottom of hub should enter neck of body while re-grinding.
Allow union ring to remain loose
4th OPERATION
When fin-ished re-grinding re-move trimmings from body.
Remove pin.
Thoroughly cleanse seat and disc seating sur-faces of ab-rasive.
5th OPERATION
Assemble
6th OPERATION

Globe
Fig. 407
200 lb. S. P.
Fig. 409
300 lb. S. P.

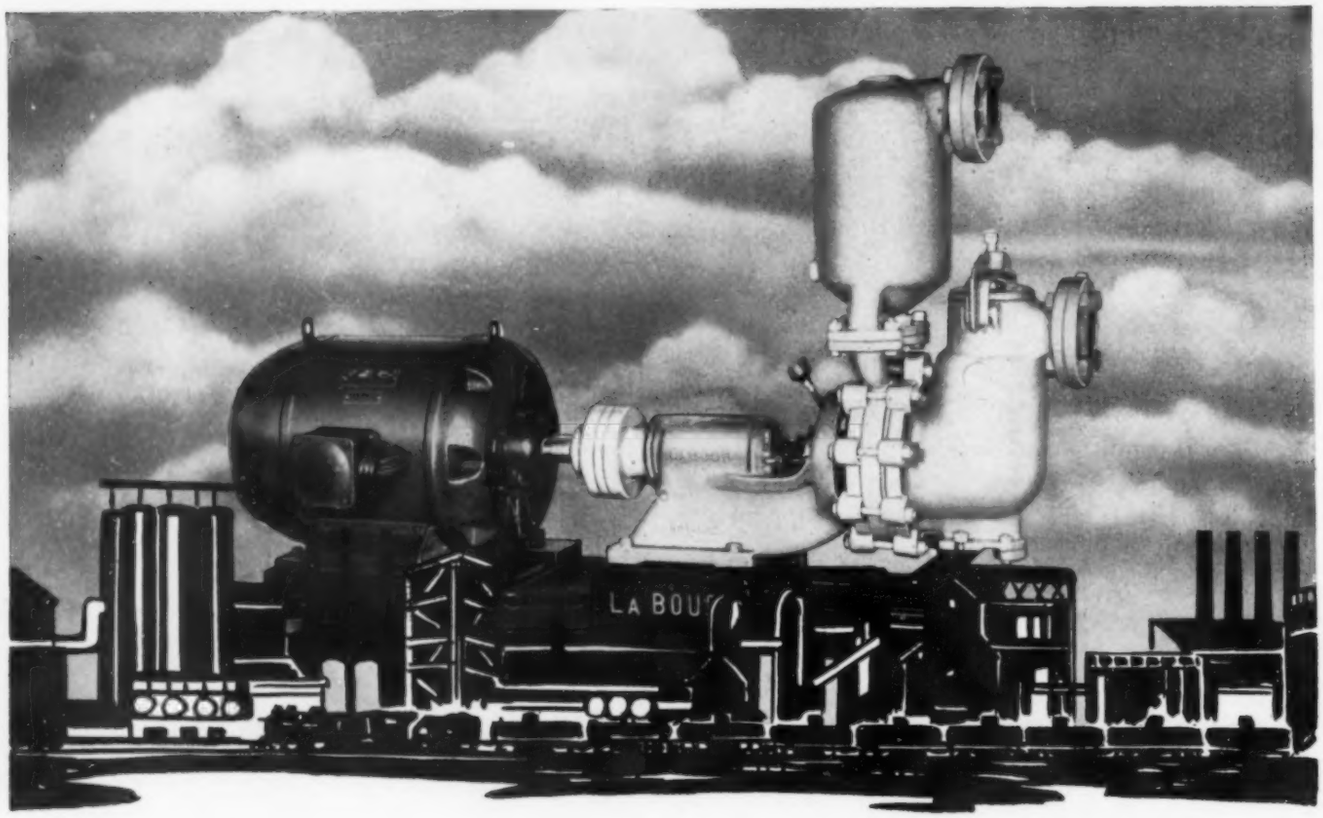
Lift Check
Fig. 414—200 lb. S. P.
Fig. 413—300 lb. S. P.

Swing Check
Fig. 554—200 lb. S. P.
Fig. 624—300 lb. S. P.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings on their orders. This will be of mutual helpfulness.

LUNKENHEIMER VALVES

3-78A-7

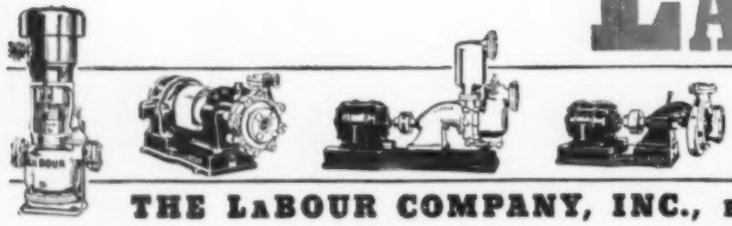


The Pump That Gave an Industry *New Ideas*

Chemical plants today are vastly different from what they were twenty years ago. "Blow cases" are all but extinct. Tanks and vats for certain liquids are now largely built without bottom outlets because of the known shortcomings of fittings and valves. Efficient plant layout determines the position and elevation of liquid processing and storing units.

These changes are based upon a single factor: The development of a satisfactory corrosion-resistant pump which could *lift liquids by suction*. The first such pump was the LaBour Self-Priming Centrifugal and the LaBour is today considered the most satisfactory pump for the purpose.

LaBour Pumps are important in the production of war chemicals, and LaBour production facilities are completely occupied with high priority orders, hence we regret the necessity for disappointing customers with less urgent needs, yet we are happy to know that the product we pioneered can now be so useful to the cause which is the first thought of all of us.

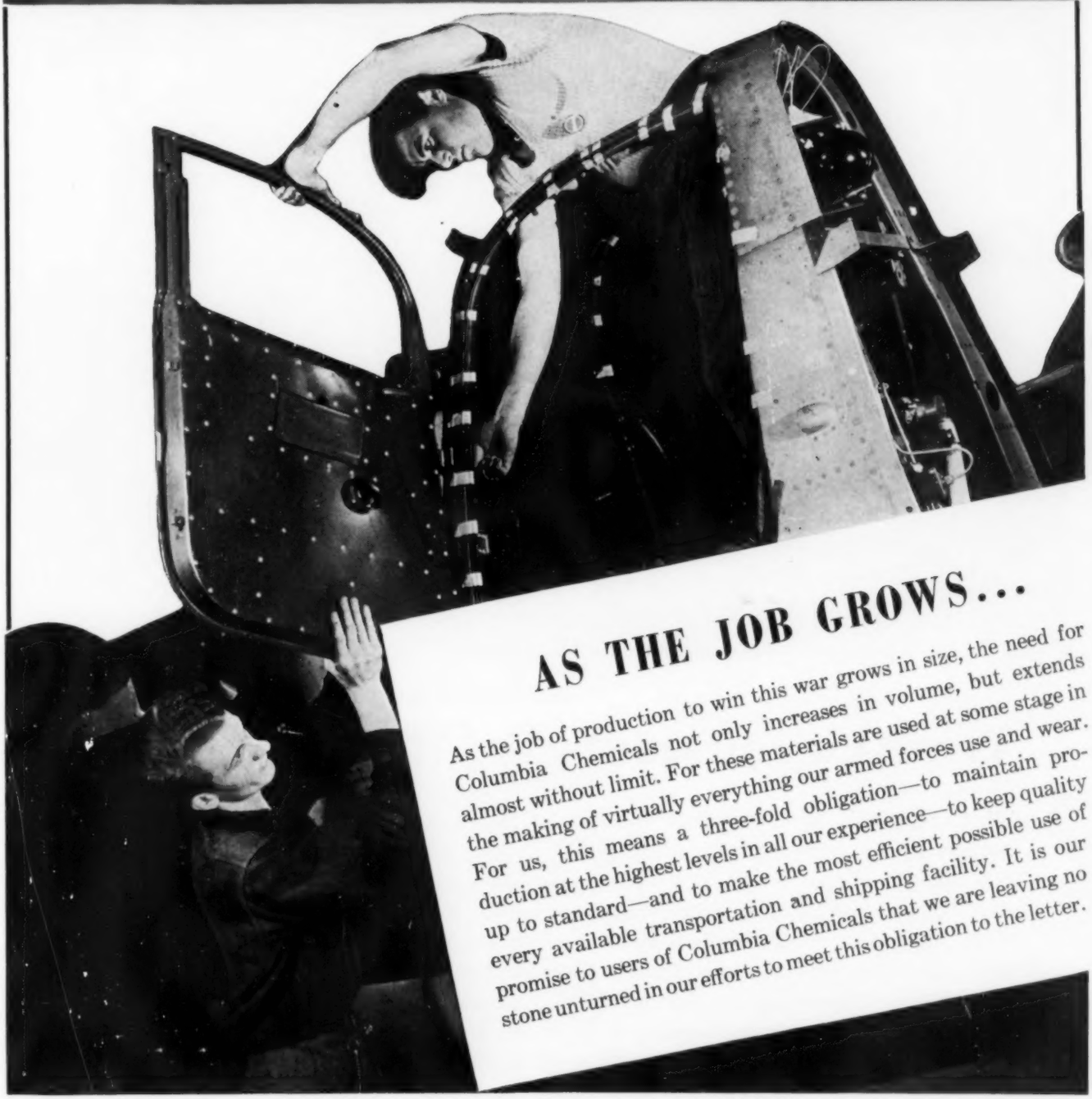


LABOUR

LaBOUR PUMPS

THE LABOUR COMPANY, INC., ELKHART, INDIANA, U. S. A.

COLUMBIA CHEMICALS



AS THE JOB GROWS...

As the job of production to win this war grows in size, the need for Columbia Chemicals not only increases in volume, but extends almost without limit. For these materials are used at some stage in the making of virtually everything our armed forces use and wear. For us, this means a three-fold obligation—to maintain production at the highest levels in all our experience—to keep quality up to standard—and to make the most efficient possible use of every available transportation and shipping facility. It is our promise to users of Columbia Chemicals that we are leaving no stone unturned in our efforts to meet this obligation to the letter.

ESSENTIAL INDUSTRIAL CHEMICALS

SODA ASH • CAUSTIC SODA • SODIUM BICARBONATE • LIQUID CHLORINE • SILENE* CALCIUM CHLORIDE • SODA BRIQUETTES MODIFIED SODAS • CAUSTIC ASH • PHOSFLAKE CALCENE** • CALCIUM HYPOCHLORITE

*Precipitated Calcium Silicate **Precipitated Calcium Carbonate

COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY

COLUMBIA CHEMICAL DIVISION

30 ROCKEFELLER PLAZA, NEW YORK, N.Y.

CHICAGO • BOSTON • ST. LOUIS • PITTSBURGH • CINCINNATI

CLEVELAND • MINNEAPOLIS • PHILADELPHIA • CHARLOTTE

What do you want—1 or 100?

Whether you order one or scores of vessels fabricated "to your specifications", the mammoth Edge Moor Shops will do it for you *on time!* We fabricate all commercial metals. Our engineering experience is such that we know the care needed to deal successfully with the individual characteristics of any given metal or alloy. Besides this technical experience, *we have the equipment.* Giant bending rolls; boring mills; lathes; planers; semi-automatic and full automatic welders; hydraulic riveters. Specialized equipment for stress-relieving, annealing, X-ray, magnaflux testing. Shop 170,000 sq. ft., served by 30 bridge cranes. All inquiries strictly confidential. Highest quality work guaranteed. Write for Products Bulletin 113.

★*One of over twenty High Chrome Iron Nitric Acid storage tanks 96" dia. x 25'0" long x ⅜" thick. All butt weld seams were X-rayed before and after annealing. Vessel annealed at 1425° F. for four hours and slowly cooled in furnace. All welders qualified U-68. This type of material (#430 Alloy 15–16% chrome) requires unusual care due to its tendency to develop cracks.*

WE KEEP 'EM COMING!

AUTOCLAVES
DIGESTERS
LIQUIFIED GAS STORAGE VESSELS
LIQUID CHLORINE STORAGE VESSELS
TOWERS
COLUMNS
BOILER DRUMS
TO YOUR SPECIFICATIONS

EDGE MOOR IRON WORKS, INC.

30 ROCKEFELLER PLAZA, NEW YORK CITY, N. Y.
PLANT: EDGE MOOR, DELAWARE
CHICAGO DETROIT CLEVELAND RICHMOND SAN FRANCISCO

★ America's all-out Victory Program requires ever-increasing quantities of coal-tar chemicals for which Barrett is a key source of supply—

Toluol for TNT . . . *Benzol* for Tetral ...*Phenol* for picric acid...*Anhydrous Ammonia* for nitric acid and ammonium nitrate...*Phthalic Anhydride* for di-butyl phthalate for smokeless powder —also for ship, tank and truck finishes... *Hydrogenated Products* to improve performance of lubricating oils . . . *Pyridines* for sulfa drugs . . . *Quinoline* for vitamins . . . *Tar Acids* for plastics, disinfectants and pharmaceuticals . . . *Rubber Compounding Products* for extending the vital rubber supply . . . *Cumar** for waterproofing tarpaulins, tenting and other military fabrics . . . *Naphthalene* and *Cresol* for insulating materials for military cable . . .

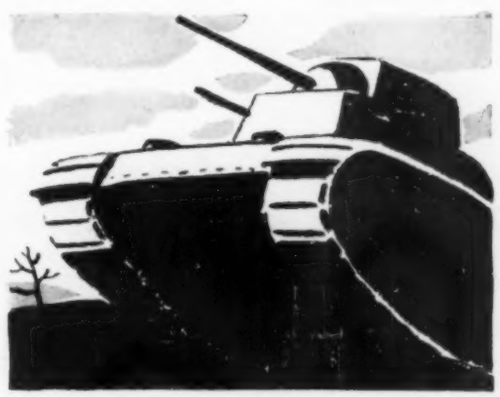
Because these and other chemicals are so vital to winning the war, we ask the indulgence of our customers in civilian industries if deliveries are delayed. Barrett's vast facilities and 88 years of manufacturing experience are being utilized to keep production at top limits.

★ ★ ★ ★ ★ ★ ★ ★

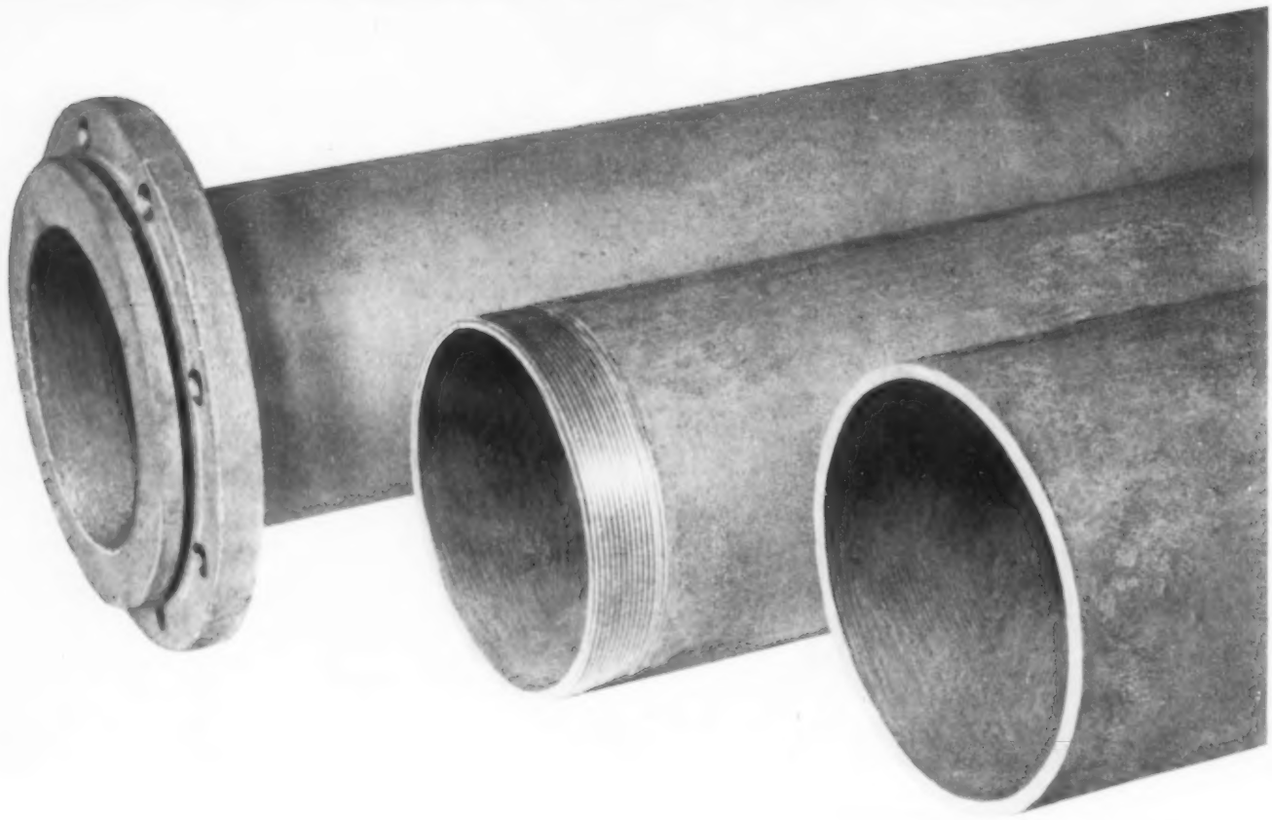
THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK
BARRETT CHEMICALS

Tar Acids
Phenols
Cresols
Cresylic Acids
Naphthalene
Phthalic Anhydride
*Cumar (Paracoumarone-Indene Resin)
Rubber Compounding Materials
Bardol*
Barretan*
Pickling Inhibitors
Benzol
Toluol
Xylol
Solvent Naphtha
Hi-Flash Solvent
Hydrogenated Coal-tar Chemicals
Flotation Agents
Tar Distillates
Anhydrous Ammonia
Sulphate of Ammonia
Arcadian* the *American* Nitrate of Soda

*Reg. U. S. Pat. Off.

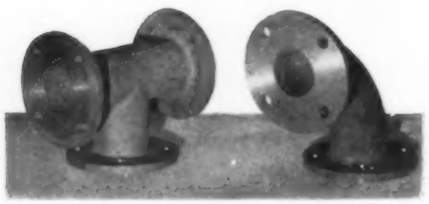


MISCO STAINLESS STEEL PIPE
CENTRIFUGALLY CAST



THE ever increasing tempo of America's war production is causing many headaches to the men who are responsible for the continuous flow of materials and supplies. In the process industries there arise corrosive problems in which stainless steel pipe and fittings play an important part. It is therefore a relief to know that Misco's entire resources are at instant command to help make the task easier.

Consult Misco on your stainless steel pipe and fitting needs. Your inquiries by telephone or wire will receive prompt attention.



MISCO STAINLESS STEEL FITTINGS

Furnished in all standard flanged and screwed patterns; in special welding and compression types and also to customers' own designs and specifications.

Michigan Steel Casting Company

One of the World's Pioneer Producers of Chromium-Nickel Alloys

MISCO
Heat and Corrosion Resistant Alloys

1983 GUOIN STREET • DETROIT • MICHIGAN

This advertisement appeared in:
NEW YORK TIMES
CLEVELAND PLAIN DEALER
DETROIT FREE PRESS
CHICAGO TRIBUNE
WASHINGTON POST
PHILADELPHIA BULLETIN
NEW YORK HERALD-TRIBUNE

Today's Sweat is Tomorrow's Victory

Behind the news of today's battles, the most amazing chapter in the whole history of mankind is taking shape.

When the chapter is ended, these battles will have become skirmishes on the road to victory . . . and men of business, labor and Washington will have licked the inventors of mechanized warfare at their own game.

The first paragraphs in the war news of the future are beginning to appear, in the production reports of America's brand-new war industries.

Tanks, planes, guns, bombs are pouring from factories that were making locomotives, autos, ladies' handbags until Pearl Harbor Sunday.

One of the most dramatic stories in the history of our times will be the production record of a cross-bred vehicle of destruction.

Half locomotive, half automobile, this cross-breed is the world's toughest, most agile and viciously efficient tank.

But the historical potency of the newly born American tank lies not so much in its ability to take and dish out punishment, as in the amazing fertility of the production lines from which it springs.

As we contemplate the industrial miracle of this rapid union of two different manufacturing methods, there are important lessons to be drawn:

▶ Compressed within the short space of a few months, we have seen a gigantic and vivid demonstration of the interdependence of industry.

This aspect of industry is not so apparent in peacetime.

OVER ▶

War gives business executives, and governmental officials, an added opportunity to study these relationships in sharp relief.

American industry is not like that of any other nation. It is more highly specialized. Therefore it is more sensitive to the technical disruptions of war production, as well as to economic and social stresses.

Another fundamental difference between American industry and other industrial systems has been highlighted by war:

Because our industry is specialized, its system of inter-industry communication has been developed to a higher degree than in any other country. Publishers call this system the "Industrial Press;" you used to think of it as the "trade papers."

▶ Industrial magazines knit together the specialized industries which comprise the total of America's marvelous productive capacity. They give men who specialize on a particular industrial function the assurance that, when they need to know about a machine, material or technique developed in another industry, complete information will be readily available.

Most people know this peace-time function of the industrial magazine. Few people know the dramatic story of how this typically American system has worked in the frantic interchange of techniques involved in war-conversion.

War-conversion, in America, means a complete disruption of specialized production routines.

In applying automotive production methods to heavy industry as represented by the tank, the interchange of information was complex and urgent.

How was it done?

Of course there was a great deal of travel between plants. Of course men plead with Washington for help. Of course there was trial and error. But if only these things had happened, we would still be building tanks in the continental manner.

Too many men, in too many plants, had too many questions for them to be solved by individual effort.

▶ Results were made the common knowledge of all, through the industrial editor. If industry "A" had solved a problem, industries "B" to "Z" found out about it in industrial magazine articles and advertisements . . . it has been the system for 50 years. It becomes more dramatic in wartime.

Few people realize that the difference between making 1 tank a month and making 1 tank every 12 minutes rest: more on solving hundreds of little problems than it does on big decisions.

Men who have drilled holes in softer metals meet new problems when they have to drill those holes through armor plate at production line speeds.

When they must cast silicon bronze, men who have been making iron or brass castings turn to the industrial editor and the industrial advertiser for help.

▶ Using cutting tools on alloy steels, when past experience has been on cast engine blocks, raises a whole train of problems involving cutting speeds, coolants, handling techniques, etc.

The training of millions of new workers was a problem needing quick solution for many a plant manager, foreman and workman.

These, and thousands of other problems, questions and answers have flowed through industry's system of communication, the Industrial Press.

The result has been a vital saving of time . . .

In recognition of the miracle of war production—accomplished through the cooperation of American management and labor with the W. P. B. . . . this advertisement is published by the McGraw-Hill Network of Industrial Communication.

• • •

THE McGRAW-HILL NETWORK

More than 1,000,000 of the executives, designers and production men, who give America her world supremacy in technical "know-how," use the editorial and advertising content of these 23 publications as a means of exchanging ideas.

American Machinist • Aviation • Bus Transportation • Business Week Chemical & Metallurgical Engineering • Coal Age • Construction Methods Electrical Contracting • Electrical Merchandising • Electrical West Electrical World • Electronics • Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets • Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Transit Journal • Wholesaler's Salesman

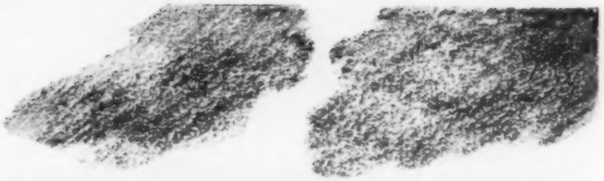
McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

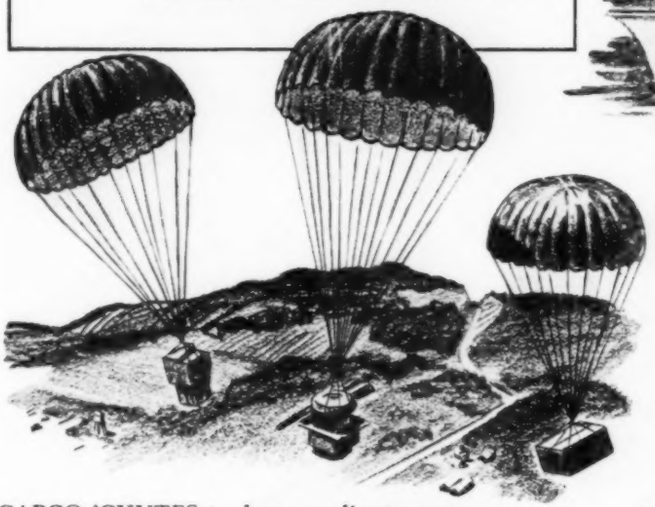
McGRAW-HILL
PUBLISHING COMPANY, INC.

330 WEST 42nd STREET • NEW YORK

Caustic Soda *helps speed America's War Effort!*



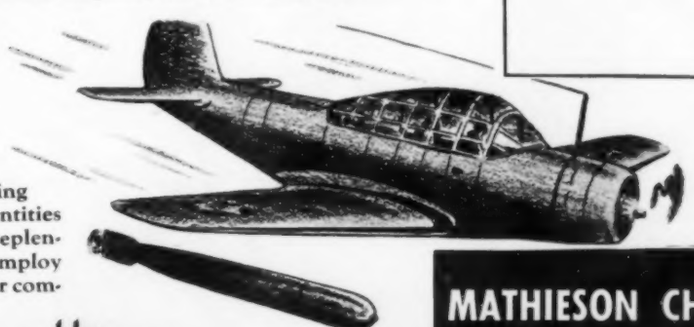
"PT" BOATS clip the waves at 70 miles per hour! Speed is their chief defense. If their powerful engines fail in battle — they are dead ducks! To assure trouble-free timing, ignition systems are insulated with phenolic resins — the best non-conductor yet devised. In the synthesis of phenol by the sulfonation process, caustic soda is an essential raw material.



CARGO 'CHUTES to drop supplies to paratroops or isolated garrisons are now being made of rayon. Although still in the experimental stage, rayon promises to replace other fabrics which are needed for parachutes that carry human cargoes. Largest U.S. user of caustic soda, the rayon industry produces rayon cord for tires... high-tenacity fabric for self-sealing gasoline tanks.

BIG GUNS that can tear a tank to shreds ride on tires that are part new, part reclaimed rubber. In reclaiming rubber from used tires, caustic soda is used to dissolve the cord fabric, thus separating it from the rubber which is to be reworked.

UNCLE SAM'S "Battlewagons" pack a lethal wallop with their bristling batteries of 16-inch rifles. Breeches are loaded with smokeless powder neatly stitched in silk bags. In the manufacture of smokeless powder, caustic soda is used to purify the cotton linters.



TORPEDO PLANES are poison to enemy warships. Whether based on land or sea-roving carriers, U. S. warplanes burn staggering quantities of lubricants and high octane gasoline. In replenishing vital supplies of fuel, oil refineries employ caustic soda to remove objectionable sulphur compounds from petroleum products.

MATHIESON CHEMICALS

THE MATHIESON ALKALI WORKS, (INC.)

60 E. 42ND STREET, NEW YORK, N. Y.

LIQUID CHLORINE . . . SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . BLEACHING POWDER . . . HTH PRODUCTS . . . AMMONIA, ANHYDROUS and AQUA . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS . . . SODIUM CHLORITE PRODUCTS

BTU's ARE BULLETS

CONSERVE AND CONTROL THEM WITH EFFICIENT INSULATION

To conserve fuel and control temperatures, use *efficient* Mineral Wool Insulation. No other insulation offer so many advantages: Low Thermal-Conductivity, Easy to Apply, Lightweight, Fire-safety, Long-lived efficiency *and* Lower Cost.

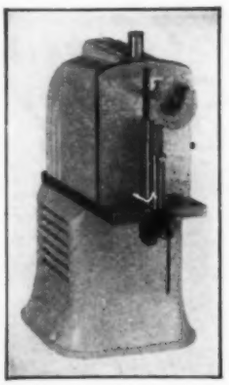
Investigate the many-sided savings of Mineral Wool Insulation on Process Steam and Heating Lines, Fittings, and Flanges as well as on Reaction Vessels such as Autoclaves, Kettles, Evaporators, etc., etc.

Write today for complete data and copy of Institute-bulletin "Efficiency".

INDUSTRIAL
MINERAL WOOL
INSTITUTE

441 Lexington Avenue • New York City

THE NEW PerfeKtum AMPFIL



A new stream-lined automatic-electric ampoule filling apparatus . . . for rapid and accurate filling of ampoules, vials and bottles. Will fill 800 to 1200 per hour. Exceptionally accurate predetermination of volume. Stainless steel construction. Improved final drop eliminator. Readily sterilized. The new PerfeKtum AMPFIL is available in sizes ranging from the standard for filling ampoules up to 10cc plus to heavy duty machines handling capacities up to 500 cc.

PerfeKtum
TRADE MARK REG.

Write for details

PerfeKtum Products Co.

300 FOURTH AVE. NEW YORK, N. Y.

WIN *YOUR* BATTLE OF PRODUCTION

• For heavy duty industrial metal cleaning in **steel plants** and **metal working plants** . . . chemical processing work in **paper** and **textile mills.**

Use a Cowles Silicate

★**DRYMET** (REG. U. S. PAT. OFF.) **Anhydrous Sodium Metasilicate**

Drymet can be used alone or with other alkaline products, phosphates, soaps, etc., to give shorter cleaning time and better results. Drymet will give you free-flowing, non-caking detergents.

★**DRYORTH** (REG. U. S. PAT. OFF.) **Technically Anhydrous Sodium Orthosilicate**

Dryorth is a concentrated, trigger-action, high pH detergent silicate with excellent penetrating and wetting-out properties. It has speedy, dirt-loosening, prolonged suspending-emulsifying power.

★**CRYSTAMET** (REG. U. S. PAT. OFF.) **Pentahydrate Sodium Metasilicate**

Crystamet is a pure, perfectly white, free-flowing granular product with the normal 42% water of crystallization. It can be used alone on medium pH jobs.

• **These silicates are sold at heavy chemical prices**

THE COWLES DETERGENT CO. • Cleveland, Ohio

Please quote prices on (Quantity)

☐ DRYMET ..... Drums (400 lbs. net)
☐ DRYORTH ..... Drums (400 lbs. net)
☐ CRYSTAMET ..... Barrels (300 lbs. net)

Name _____

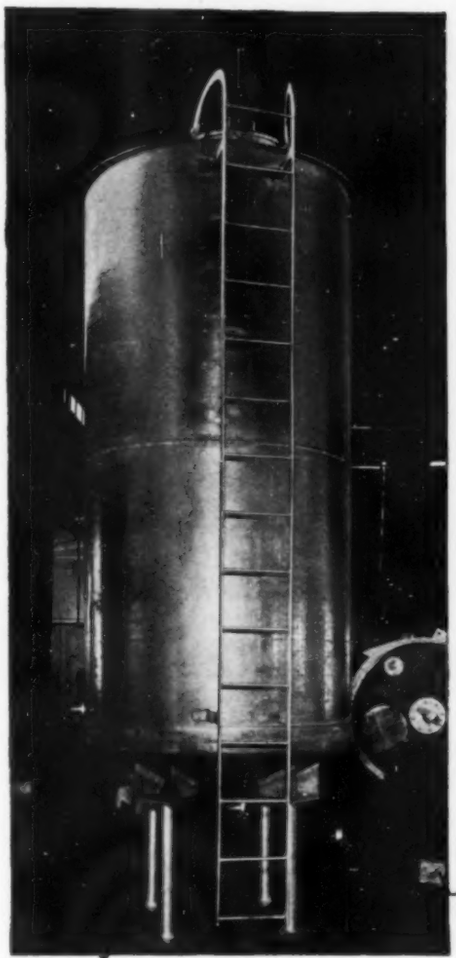
Company _____

Address _____

THE COWLES DETERGENT COMPANY
7016 EUCLID AVENUE • CLEVELAND, OHIO

Designed for a War Industry

BY PATTERSON-KELLEY



66" in diameter and 152" high, this Patterson-Kelley Vertical Storage Tank is constructed of 1/2" aluminum plate. It contains 66' of 1 1/2" aluminum I.P.S. tubing. Fill chute measures 14" x 20". The ladder is of steel.

This aluminum stearic acid remelt tank is a product of Patterson-Kelley's years of practical experience in engineering durable, efficient industrial equipment. From blue print to installation of the completed tank, Patterson-Kelley engineers and designers, mechanics and inspectors make it their business to see that the finished product meets performance specifications to the letter.

That's the kind of teamwork that has become familiar practice in Patterson-Kelley's East Stroudsburg plant. Through the years, it has resulted in re-orders of Patterson-Kelley autoclaves, kettles, cookers, separators, stills, tanks and heat exchange equipment from many of America's largest industries. These units may be fabricated in a variety of metals and alloys to meet the most exacting requirements of your operating conditions.

Patterson-Kelley's enviable reputation for dependability and quality workmanship invites *your* confidence. If you have an equipment problem, why not consult our engineers — at no cost to you? Write today for your free copy of the Patterson-Kelley Chemical and Process Equipment Catalog.

EST. 1880

PATTERSON-KELLEY *FOR DEPENDABLE ECONOMICAL SERVICE*

THE *Patterson-Kelley* CO., INC.

112 WARREN ST., EAST STROUDSBURG, PA.

MANUFACTURERS FOR THE CHEMICAL AND PROCESS INDUSTRIES

SPEED—
COMES NATURAL TO ESOTOO*

In many processes ESOTOO* can save time—reduce costs—speed up production—because it cuts man-hours—delivers clean, cool 100% SO_2 to the process—helps to prevent undesirable side reactions and assures positive control and simplified operation.

A relatively short haul to many of the country's largest industrial centers adds the very important advantage of prompt delivery from the strategically located works of the Virginia Smelting Company.

*"ESOTOO" is Virginia's Trade Name for Liquid Sulfur Dioxide

About Shipments—

Portable cylinders containing 150 lb., semi-portable drums containing 2000 lb. liquid SO_2. L. C. L. or carload.

Carload: 15 drums on multi-unit car frame; 30,000 lb. For users without storage facilities.

Tank car lots of 40,000 lb. for users equipped with storage facilities.

Shipment same day as receip of order from the strategically located works of the larges producer of liquid sulfur di oxide in the U. S.

V VIRGINIA

VIRGINIA SMELTING COMPANY
WEST NORFOLK, VIRGINIA

STAINLESS EQUIPMENT

Easy-to-clean, corrosion-resistant, stain-resistant! No seams . . . no rivet heads . . . no chance of metallic contamination for *your* product. LEE Stainless Processing Kettles, Tanks and Equipment provide every advantage for fast, dependable food and material processing. Do you have our latest catalog?

LEE METAL PRODUCTS CO., INC.
412 PINE STREET
PHILIPSBURG, PENNA.

WRITE FOR THE LEE CATALOG!

LEE

3 BIG SAVINGS WITH ROPER Rotary PUMPS

1 — SAVE 50% TIME

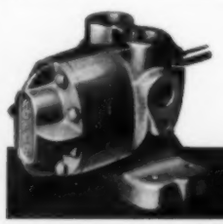
Saving installation time is most important in plants producing for Victory—one customer writes: "So far the new ROPER has proved the easiest of all to install. In fact the last 6 ROPERS installed saved 18 hours labor—about 3 hours on each."

2 — SAVE 52% SPACE

Today with increased production so vital plants welcome opportunities to get efficient equipment that saves space. Roper "direct drive" pumps require only 48% as much floor space as other models.

3 — SAVE 20% POWER

Here is another saving important to the Victory program—Roper "hydraulically balanced" Pumps reduce power consumption as much as 20%.



HYDRAULICALLY BALANCED

Send for FREE Catalog with valuable pumping information.

ask for Catalog 941

GEO. D. ROPER CORP.
ROCKFORD, ILL.

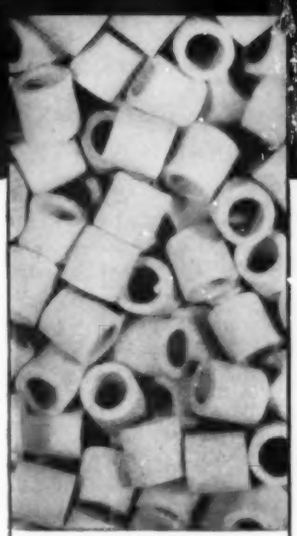
In Processing of Corrosive Liquids . . .

The Shortest Line

from Drafting Board to All-Out Production is

Lapp

Chemical Porcelain



Lapp Raschig Rings bring to tower packing all the advantages of Lapp Chemical Porcelain—iron-free purity, high strength, non-crumbling long service. Most sizes are available from factory stock.

Do you contemplate a plant or a system for the processing of corrosive liquids? If it's in the blue-print stage, it's but a few weeks away from full-scale production, so far as pipe, valves and tower packing are concerned—if the specifications call for Lapp Chemical Porcelain. For this is one material you can still get. All the priority rating we need is enough to cover pipe flanges, valve hardware and other metal parts. Our facilities are adequate to keep well ahead of your plant construction schedule.

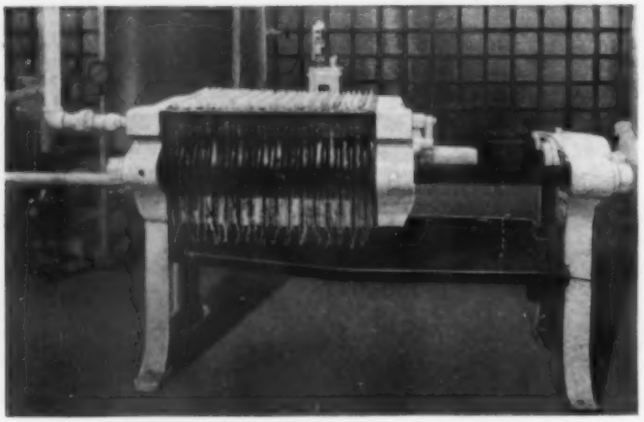
When you get into production, you'll find the purity of your product as good—or better—than you could get with any other corrosion-free material. You'll find it will outlast most others, that it continues year-in-and-year-out its "first month" quality of performance. All these things are functions of the material itself—its dense, thoroughly vitrified *non-porous* body, its strength, its completely iron-free purity. May we send you the whole story? Lapp Insulator Co., Inc., Chemical Porcelain Division, LeRoy, N. Y.

Lapp *Chemical Porcelain*

Valves • Pipe • Raschig Rings

Don't let

Filtration Difficulties
HOLD UP PRODUCTION!



We've got a tough job on our hands—all of us. We've got to produce — and keep on producing — more and more. We can't afford delays of any kind. And that means that every piece of equipment in every plant must give maximum service day and night.

We have specialized in the design and manufacture of Industrial Filtration Equipment for more than 45 years. We've successfully solved difficult filtration problems relating to practically every type of industrial filtration. If you are not getting completely satisfactory results and maximum output, we suggest that you consult Sperry at once. Our engineers will gladly make a thorough analysis and submit unbiased recommendations without obligation.

★

Don't delay. Check your filtration equipment at once. Make certain of maximum production for Victory.

Send for FREE Fact Book

Contains valuable charts and data on Industrial Filtration as well as illustrations of many types of filter presses. Write for your copy today.

D. R. SPERRY CO., BATAVIA, ILL.

Filtration Engineers for Over 45 Years

Eastern Sales Representative
HENRY E. JACOBY, M. E.
205 E. 42nd St., New York
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Merchants Exchange Bldg.
San Francisco, Calif.

SPERRY FILTER PRESSES

ALKALIES

• • • No. 1 BASIC MATERIALS FOR UNCLE SAM'S ARSENAL!

Perhaps you as a manufacturer of papers, metals, textiles or some other commodity do not realize that alkalies are a factor in nearly all industries—*practically every one of which is on a war time production basis.*

This explains why, even though Solvay is America's largest producer of alkalies, it cannot always supply full alkali requirements of the many Solvay customers who manufacture other than war materials.

Yet, as fast as changeovers can possibly be made, we are *increasing* production of important alkalies and related products to meet war time needs. At the same time, it is possible that Solvay Technical Service may prove helpful in finding a solution to problems arising from material shortages. Inquiries are cordially solicited.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET NEW YORK, N. Y.

BRANCH SALES OFFICES:

Boston • Charlotte • Chicago • Cincinnati
Cleveland • Detroit • New Orleans • New York
Philadelphia • Pittsburgh • St. Louis • Syracuse

More Nitric for World War II

U·S·S STAINLESS STEEL ductwork for safely handling corrosive nitric acid vapors.

How Stainless Steel has helped to step up production of high explosives

BACK IN 1917-18 our hard-fighting chemical industry produced enough nitric acid to meet the demands of explosive manufacture only by dint of grim determination. Process equipment presented serious difficulties from the standpoint of maintenance. In those days, you may recall, nitric acid was made by reacting sodium nitrate with sulphuric acid. The materials then available for handling this process didn't stand up, either because of the lack of corrosion resistance or poor mechanical properties. Naturally, production suffered because of wasteful down-time.

TODAY IT'S A DIFFERENT STORY. Production of nitric acid isn't slowed by an ever-present maintenance problem. Stainless steel has given chemists the tool for taking advantage of a process for making nitric synthetically by the direct oxidation of ammonia with the oxygen of the air. This superior process involves the handling of corrosive liquids and gases at high temperatures and pressures—a condition that could be met only by stainless steel's high resistance to corrosion and heat, plus its high mechanical strength.

AMMONIA OXIDATION EQUIPMENT is made principally of steel, including both the straight chrome and the chrome-nickel stainless steels. These alloys give the highest corrosion resistance consistent with satisfactory physical and welding qualities.

HUNDREDS OF TONS of U·S·S Stainless Steel are already busy in the nitric industry in the form of tanks, columns, trays, pipes, etc. Our engineers are ready to help you apply more of this versatile material where it will do the most good for the cause of war production. For condensed information, write for the booklet, "U·S·S Stainless and Heat Resisting Steels for Modern Industry."

What About the Availability of Stainless Steel?

Stainless steel is an important war material. It can be obtained only for applications which are vital to the war effort. Many chemical applications qualify. Where you have been granted sufficiently high priorities, we can supply the U·S·S Stainless Steel you must have.

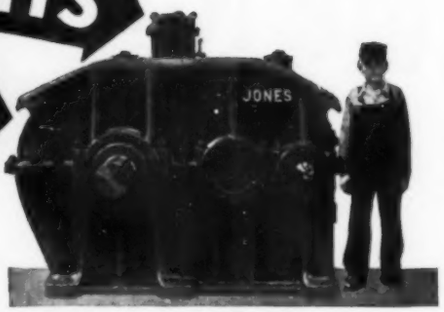
U·S·S STAINLESS STEEL

"Be glad it's Stainless . . . it lasts longer!"

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
NATIONAL TUBE COMPANY, *Pittsburgh*
Scully Steel Products Company, Chicago, *Warehouse Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

Whether you need THIS —or THIS



You can get what you want in the complete range of Jones Herringbone Speed Reducers

YOU will find this 128-page catalog of Jones Herringbone Speed Reducers helpful in the selection of reducers in accordance with A.G.M.A. recommended practice for all conditions of service. Jones Herringbone Speed Reducers are built in single, double and triple reduction types and in every standard ratio in ratings ranging from 1.25 H.P. to 440 H.P.

All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout. Liberal stocks are carried to facilitate shipments.

Catalog No. 70 will save you time and effort in laying out drives that call for Herringbone gears.

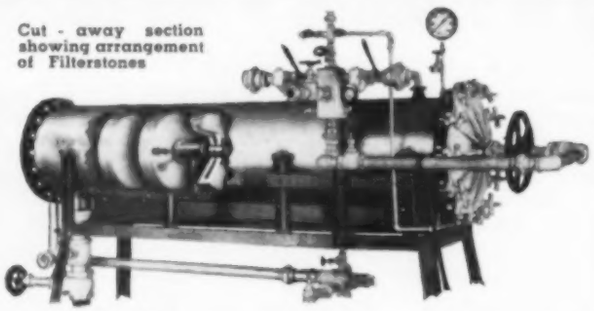
WRITE FOR YOUR FREE COPY

W. A. JONES FOUNDRY & MACHINE CO., 4415 Roosevelt Rd., Chicago, Ill.

Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS • PULLEYS
CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

Cut - away section showing arrangement of Filterstones



no cloth, no paper, no screens

IN LEVAL CLARIFYING FILTERS

Clean Without Dismantling

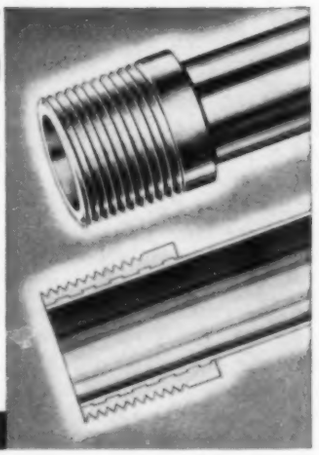
The patented LeVal Filterstones resist chemical action and extremes of temperature. LeVal filters use low-cost, easily-obtainable filter-aids.

Standard models are complete with pumping unit. Large capacity filters fabricated to any specifications. Write for folder 63 summarizing the low-cost LeVal method and self-cleaning features.

LEVAL FILTER COMPANY
1319 S. Michigan Ave. Chicago, Ill.
Representatives in principal cities

25% TO 45%

SAVED ON STAINLESS STEEL PIPING COSTS



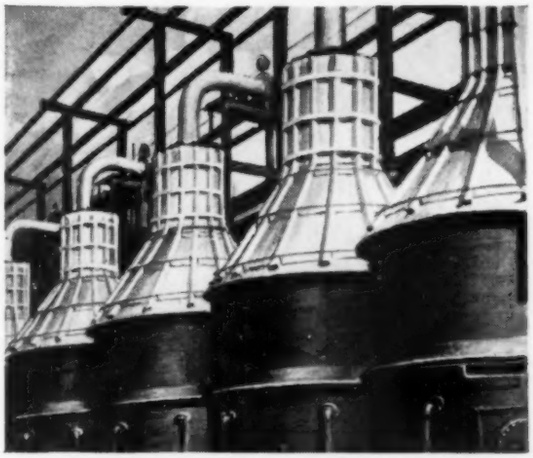
The Wallace Pipe Joint permits use of light gauge tubing where pipe of standard gauge would otherwise be required. Critically needed stainless steel is saved, (about 65%). A special threaded and enlarging ferrule is inseparably joined to a length of stainless tubing through the medium of expansion. No soldering or welding. Average installation time per joint, two minutes.

Write for new folder just published which gives full details. Exclusive licensee—

TRI-CLOVER MACHINE CO. • KENOSHA, WIS.

The WALLACE PIPE JOINT by TRI-CLOVER

Tanks that can "Take It" and "Dish It Out"



1. THESE DAYS THAT'S A MUST for industrial acid tanks as well as war tanks. Acid producing and handling equipment has to take the 24 hour-a-day punishment of the non-stop production drive and keep on dishing out essential war materials—munitions, oil, metals, textiles, acids. That's why Tellurium Lead is used—not only for tanks but also for pipe lines and coils.

2. THIS NEW ALLOY STRENGTHENS UNDER STRESS —actually *work-hardens* when hammered, rolled, bent or stretched. A tough lead to begin with, it gets tougher. Thus joints and turn-over points are less subject to cracking . . . buckling and creeping are minimized . . . and resistance is increased to vibration and to fracture from repeated heat changes.

3. ANOTHER ADVANTAGE: Tellurium Lead is a heat-resistant lead—even at elevated temperatures it exhibits improved resistance to corrosion by sulphuric and other acids. In fact corrosion tests demonstrate that it will withstand acids at temperatures approaching its own melting point.

4. TELLURIUM LEAD IS TIME-TESTED St. Joe chemical lead, alloyed with a small quantity of tellurium. To the many desirable properties of this famous chemical lead it adds the important new advantages described above. Made in sheets, pipes and coils Tellurium Lead is cutting down shut-downs in vital acid equipment . . . helping speed the output of Liberty's Arsenal.

NATIONAL LEAD COMPANY—New York, Baltimore, Buffalo, Chicago, Cleveland, Cincinnati, St. Louis; National-Boston Lead Co., Boston; John T. Lewis & Bros. Co., Philadelphia; National Lead & Oil Co. of Penna., Pittsburgh; Georgia Lead Works, Atlanta; American Lead Corp., Indianapolis; Master Metals, Inc., Cleveland; The Canada Metal Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver.

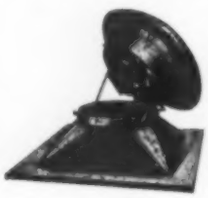
TELLURIUM LEAD

A NATIONAL LEAD COMPANY PRODUCT

GUARANTEED VENTILATION

. . . Independent of Wind Temperature and Gravity

Design of the DeBothezat "Power-Flow" Roof Ventilator provides positive ventilation at all times. Ratings are guaranteed to be independent of wind or natural draft. Works efficiently against resistance of duct systems. Low fan tip speeds. "Power-Flow" Roof Ventilators have non-overloading power characteristics. Light-proof — ready for blackout without special treatment. Low design of "Power-Flow" Roof Ventilators harmonizes with modern plant design.



HINGED TOP
New Hinged Top provides easy access to motor, fan and shutter. Top can be bolted or locked in place.

***FREE** New Book containing details on the application of "Power-Flow" Roof Ventilators. WRITE!*

DeBothezat

"POWER-FLOW"
ROOF VENTILATORS

American Machine and Metals, Inc., East Moline, Ill.

Problem . . . Solution . . .

"H & B steam jacketed fittings, in semi-steel or cast steel, offer a simple solution to the problem of transporting high temperature liquids. All common and many special fittings in stock."

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HERCULES *Carboy* BOXES

"Just drop it in—it's Packed!"

PACK ONE A MINUTE!

Make the war minutes count. Standardize on Hercules Carboy Boxes for fast packing.

No skilled men required. Just drop the bottle in, nail down the top,—it's packed and protected for long service by Hercules resilient but strong construction. Cork cushions are quickly replaced and interchangeable.

Leading chemical shippers have used Hercules for years, and now more than ever!

ICC-1A, in 5 and 13 gallon or special sizes.

We also make Multiple Bottle Boxes — any size, any type, special and standard.

Specialists for 35 years.

NATIONAL BOX & LUMBER CO.
NEWARK • NEW JERSEY

CATALYTIC CRACKING...

• Today's U. S. Army, Navy and Marine Corps planes are out-flying and out-fighting anything else in the air — thanks to the super fuel, 100-octane aviation gasoline made possible by catalytic cracking processes.

The catalyst powders used in this modern processing technique are extruded after mixing, and used as pellets for addition to raw petroleum products. But first they must be absolutely uniform — and that's where Simpson Intensive Mixers come in — through the true mulling principle of mixing, these catalysts are thoroughly blended to produce a final controlled uniformity that assures the highest degree of product quality.

Simpson Mixers for the preparation of catalyst powders are in use at numerous oil company plants — another example of the versatility of these units in solving all types of chemical and process industry mixing problems. Write for complete information.

Laboratory size unit with stainless steel pan to guard against contamination, and with electric heating elements for temperature control.

SIMPSON INTENSIVE MIXERS ARE BUILT IN 10 STANDARD SIZES

SIMPSON
INTENSIVE
MIXERS

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

Why wait for that last straw?

INCREASE your production — then double it — and redouble it. That's the cry these days. And still they tell us we "ain't seen nothin' yet." Manufacturing facilities that were adequate yesterday are taxed to the limit today. And it's none too soon to be anticipating the demands of tomorrow.

This is particularly true of water conditioning equipment and right now is the time to take stock of the situation — to make a survey of demand and capacity from the standpoint of quality as well as quantity. Maybe there's still a safe margin — but you'll be wise to make certain. And if you're confronted with a problem, play doubly safe and consult Graver at once.

For more than 30 years Graver has specialized in the design and manufacture of water conditioning equipment of all types. Graver engineers have tackled the most difficult water conditioning problems — and solved them. They'll gladly make an analysis of water samples and submit unbiased recommendations without cost or obligation.

Write Graver — today.

GRAVER

WATER SOFTENERS CLARIFIERS FILTRATION SYSTEMS
SEWAGE EQUIPMENT VAPOR CONSERVATION SYSTEMS
STEEL STORAGE TANKS WELDED CONSTRUCTION STRESS RELIEVING
X-RAYING FABRICATED STEEL AND NON-CORROSIVE PLATE

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Available Now!

☆ With the restrictions and slow deliveries on Natural Resins and many of the synthetic resins, many manufacturers are turning to available Neville Coumarone-Indene Resins. Some of the more available grades are listed below.

These resins are neutral, waterproof resistant to chemicals, and soluble in low-priced solvents. Pale or dark colors in 5-160° C melting points.

NEVINDENE*
NUBA*
PARADENE*
"R" RESINS
"G" RESIN
465 RESIN

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PITTSBURGH • PA.
Chemicals for the Nation's War Effort

A-3 * Reg. U. S. Pat. Off.

COLMONOY

SAVE TIME—SAVE PARTS WITH COLMONOY

Don't scrap those worn parts—sleeves, plungers, seal rings and other parts that must resist acids, caustics and abrasion. Hard-surface them with COLMONOY and put them back to work.

Old parts that are thus reclaimed by COLMONOY will outwear and out-perform new, unsurfaced parts. Save time! Save vital materials! Save money!

WRITE FOR CATALOG

Full information on all grades of COLMONOY— for greater resistance to corrosion and abrasion.

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BRANCH OFFICES AT NEW YORK CITY, BLASDELL, N. Y.
CHICAGO, TULSA, WHITTIER, CALIF.
OTHER BRANCHES IN CANADA

COLMONOY
Hard Surfacing Alloys and Overlay Metals

"NO HIDING PLACE HERE FOR ENEMY AGENTS!"

When the enemy agents that attempt to hamper your production hide in the guise of pipe line corrosion, contamination, scaling and resistance to flow—you have a job for PYREX Piping.

In vitally important chemical processes . . . in food handling . . . wherever these attacks can be dangerous, PYREX Piping brings the destructive efforts into the open.

On constant 24-hour guard duty, PYREX Piping is always ready to tell you at a glance the condition of pipe line and contents. PYREX brand Industrial Glass is transparent . . . and it maintains that transparency longer under the most adverse conditions. PYREX brand Industrial Glass has remarkable resistance to all acids and alkalies in solution (except HF). It is remarkably resistant to thermal shock and can be flushed *clean* with hot water, hot acids or steam. It may be the answer to your most pressing production problem. Write—

"PYREX" is a registered trade-mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

CORNING
Glass Works
Corning, New York

Pyrex Industrial Glass

Which Would You Rather Buy ?

A New Valve — or — Renewable Seats

Thousands of dollars worth of brass gate valves are consigned to the scrap heap every year when they are as good as new except for a leaky seat. But it's different with Fairbanks *Renewable* Valves. They eliminate that waste.

Instead of throwing away a Fairbanks "Renewable" Bronze Gate Valve when the seat rings finally become worn, you can quickly slip in new ones—and the valve is as good as new at about 10% of what a new valve would cost. This takes only a few minutes—just long enough to unscrew the bonnet and slip in a new ring. And that can be done without removing the valve from the pipe line.

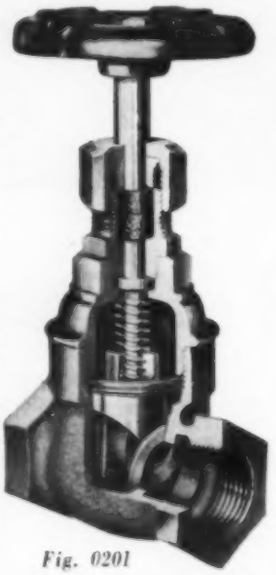


Fig. 0201
150 lbs. steam pressure

Contrast this quick, easy and inexpensive renewal with non-renewable valves that have the seats cast integral with the body.

Quick renewal is important when shutting off the steam for a long time means the shutdown of machinery for the same period.

Our valve book No. 21 contains some facts that will interest you. Write for a copy and the name of our nearest distributor.

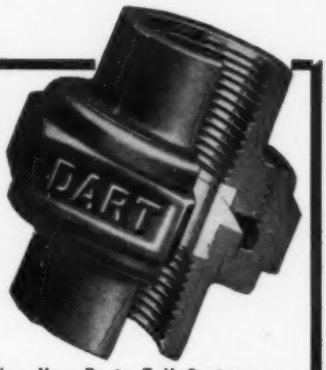
THE FAIRBANKS COMPANY
25 East 4th St., New York, N. Y.

Valves, Dart Unions, Hand Trucks and Wheelbarrows

Boston, Mass., Pittsburgh, Pa.
Distributors in Principle Cities

Fairbanks Renewable Valves

CASH IN on the EXTRA Dart Dividends



While Selling New Darts Tell Customers To Use Their Old Ones, Too

We are continuing to recommend to manufacturers that they put their "retired" Dart Unions back to work . . . and we suggest again that when you are out selling new Darts, you make the *same* recommendation.

Darts pay extra dividends in performance and service life. Their matched bronze seats, ground to "true-ball" surfaces make it possible for Darts to be used again and again, with "first-time tightness". Dart bodies and nuts are made of air refined malleable iron which explains why Darts can take rough handling, resist corrosion and pipe strains.

If *not* a Dart jobber, write for the Dart Jobber Policy today.

DART UNIONS

E. M. DART MFG. CO., PROVIDENCE, R. I.

SALES AGENTS: THE FAIRBANKS COMPANY, NEW YORK AND ALL BRANCHES — CANADIAN FACTORY: DART UNION COMPANY, LTD. TORONTO, CANADA

NEED HELP ON YOUR WARTIME PACKAGING?

Get in touch with

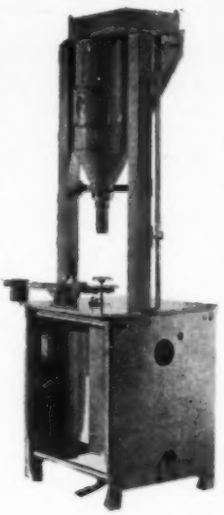
S & S

New restrictions — new requirements making changes in your packaging? Perhaps we can help you make the necessary transitions!

We have wide experience in building automatic and semi-automatic Filling, Packaging and Wrapping Machines for powders, pastes, granular and other free-flowing materials—operating at speeds to suit the need: 15—30—60—120 per minute.

Consult us freely about your problem—we'll aid in anyway we can.

Write



STOKES & SMITH Co

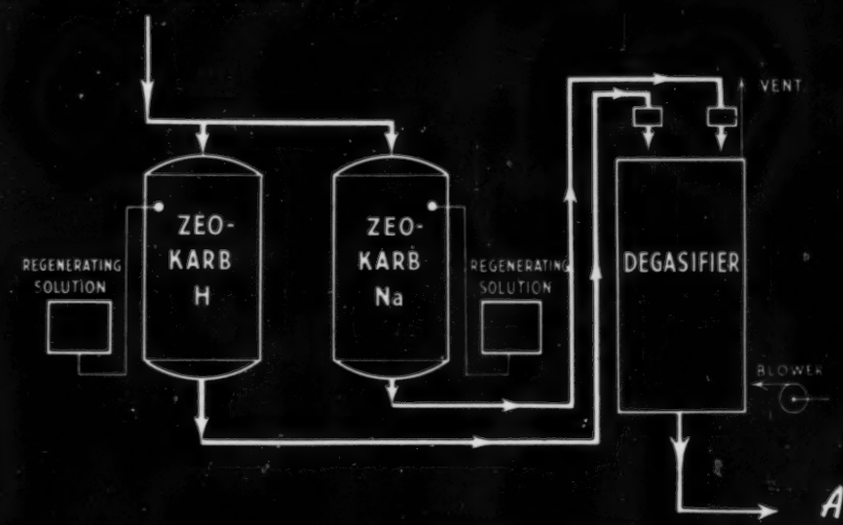
Packaging Machinery
4914 Sumerdale Avenue

Paper Box Machinery
Frankford, Philadelphia, Pa.

PROBLEM: TO PRODUCE WATER OF

1. ZERO HARDNESS
2. LOW TOTAL SOLIDS
3. ANY DESIRED ALKALINITY

Before treatment, the "natural" water supply contains calcium, magnesium, sodium.



After treatment by Permutit's non-siliceous zeolite, ZEO-KARB*. By exchanging hydrogen ion for metallic cations, all salts are converted to the corresponding acids. A second stream of water passes through a twin Zeo-Karb unit, operating on the sodium cycle. Both waters are of zero hardness. Bicarbonates are removed, as CO_2, by deaeration of the hydrogen zeolite treated water, thus reducing total solids. The two effluents are blended to any desired alkalinity.

ONE OF THE CONTRIBUTIONS TO BETTER WATER CONDITIONING BY

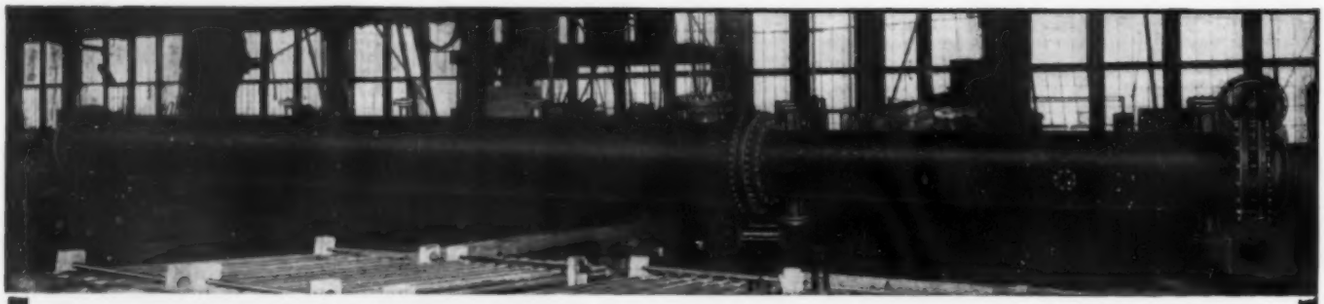
PERMUTIT

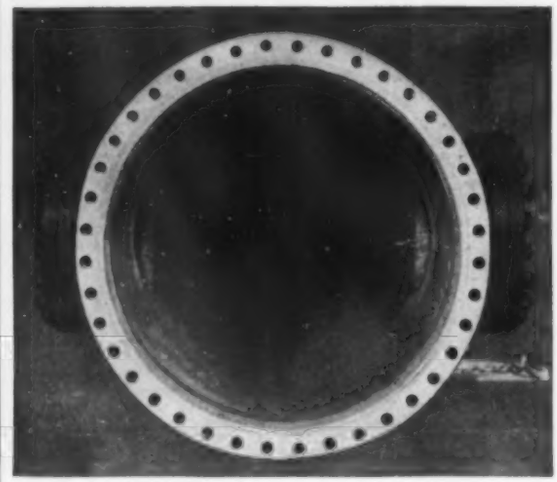
WATER CONDITIONING HEADQUARTERS

BRING YOUR WATER PROBLEM TO PERMUTIT. Get the benefit of Permutit's 29 years of experience. Permutit can make a water supply fit any individual requirement. The Permutit Company, Dept. K, 330 West 42nd Street, New York, N. Y. In Canada: Permutit Company of Canada, Ltd. . . . Montreal . . . Toronto . . . Winnipeg . . . Calgary.

N.B. Ask about Permutit's Demineralizing Process which produces the equivalent of distilled water for less than 5% of the cost of distillation.

*Trademark Reg. U. S. Pat. Off.





(Top) Shop view of long column under construction.
(Bottom) Looking into large diameter column.

Columns and Pressure Vessels of Steel, Everdur, and Stainless

1. Whitlock operates its own boiler and machine shops.
2. Whitlock welders are qualified to make pressure vessels to A.S.M.E. Code requirements, U-68 or U-69.
3. Whitlock X-ray testing equipment available for use when such testing is specified.
4. Whitlock Engineers have had years of experience—it's at your service.

Send specifications for your next job to—

THE WHITLOCK MANUFACTURING CO.

94 South St., Elmwood Hartford, Conn.
District offices in New York, Boston, Chicago, Philadelphia, Detroit, Richmond

Laboratory Wall Table No. S-2080

"VICTORY" Tomorrow May be Born in The Laboratory Today!

● Appreciating the vital part Science is taking in America's war effort, Kewaunee is bringing to the cause all the experience, skill and facilities that have marked Kewaunee leadership in times of peace.

● Now widely serving the Army, Navy, Chemical Warfare and War Production Industries we offer the most complete line of Wood or Metal Furniture.

● *Prompt service on Floor Plan Layouts, Budget Prices or Bids. Write for recent Wood or Metal Laboratory Furniture Catalog.*

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LABORATORY FURNITURE EXPERTS
Established 1905

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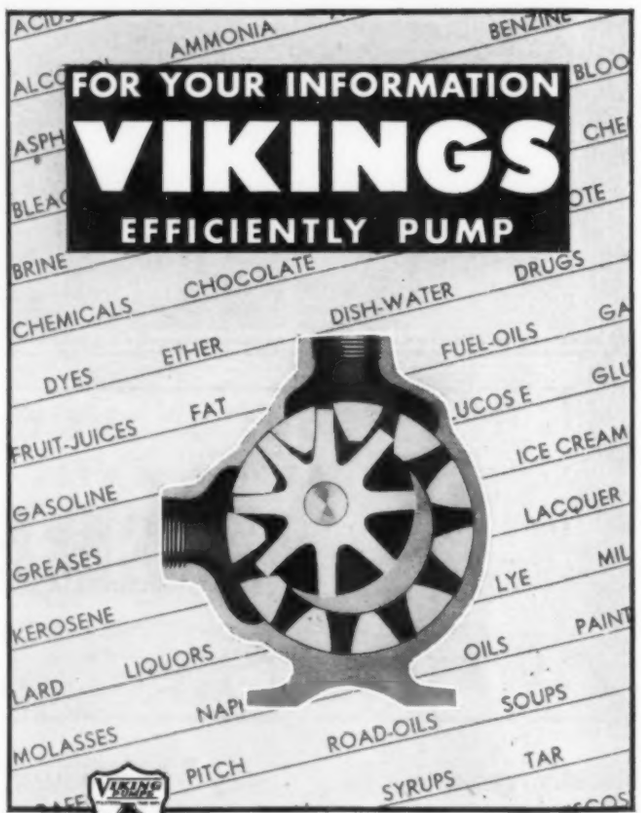

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VIKING Pump COMPANY
CEDAR FALLS IOWA

Turbo-Topics

Turbo-Equipment for solving the more difficult problems in the mixing of liquids with liquids, solids and/or gases.

The Turbo-Mixer Corporation devotes itself exclusively to solving the more difficult problems of mixing liquids with other liquids, solids, and/or gases by means of a careful diagnosis of each case, interpreted by a staff of experienced chemical engineers. The soundness of approaching mixer design from the chemical engineering viewpoint has been amply demonstrated by the achievements of Turbo-Mixers in the process industries. Our daily experience in solving the mixing problems of many unrelated industries enables us to apply knowledge gained in one industry to another.

Every effort is made to embody in Turbo-Mixers the most modern approved principles of machine design and to use the best materials available for each part.

CONTROLLED AGITATION

Circulation of the charge may be gentle or violent as required, gases may be introduced with or without compressors or blowers dependent on operating conditions and the time of contacting the reagents under agitation may be accurately governed.

CHARACTERISTIC FEATURES

Either one or more impellers, open or closed, may be used; they may be horizontal or tilted; driven from above or below; and located either on the central axis of the tank or off center. In some applications, stationary deflecting blades are necessary. In all cases the selection of the proper type, number, and location of the impellers, as well as the speed of rotation, are critical factors.

Turbo-Impellers circulate from 50 to 30,000 gallons of solution per minute to give the proper action in tanks of from 1 to 500,000 gallons capacity. The use of multiple impellers on the shaft gives even greater re-circulation.

ADVANTAGES

Turbo-Mixers are suitable for either batch or continuous operation. They will efficiently mix miscible liquids of all viscosities from 1 to 400,000 centipoises, and uniformly blend immiscible liquids throughout the above viscosity range. Their advantages have been demonstrated in the mixing of liquids with gases, as in solutions of gases in liquids, hydrogenation, oxidation, etc.; and in mixing liquids with solids for suspension, precipitation, dissolving, crystallization, dispersion, etc.

In the various forms in which Turbo-Mixers have been developed, the following specific advantages have been obtained:

(1) Better Mixing
(2) More Uniform Product
(3) More Complete Dispersion
(4) Reduced Power Consumption
(5) Perfect Circulation
(6) Reduced Mixing Cycle
(7) Increased Reaction Rates
(8) Increased Capacity
(9) Efficient Gas Absorption
(10) Assured Continuity of Service
(11) High Rate of Heat Transfer
(12) Simplification of Process

These advantages lead to such direct benefits as lower operating costs, savings in number and size of tanks, reduction of floor space required, minimum material in process, increased output, improved quality of products.

TURBO MIXER

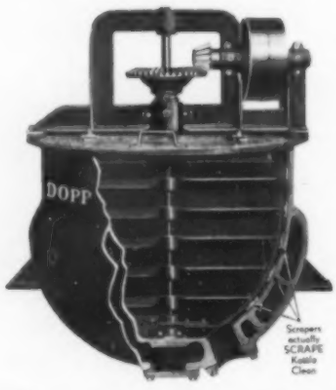
TRADE MARK

CORPORATION

128

General Offices and Laboratory, 247 Park Avenue, New York

COMMERCIAL ORDERS STILL BEING FILLED



One of 13 Agitator Styles

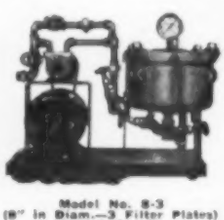
Of course we have orders with high priorities———as is to be expected of a concern with experience and facilities———but at the same time, without interfering with high priority orders, we have made good deliveries of lower priority orders which did not conflict. Perhaps the Dopp that you need for making important savings or increasing production is in this class. Let us send you Discussion No. 3 about the savings resulting from Dopp-type positive scraping.

DOPP CAST • SEAMLESS • SCRAPED **KETTLES**

MADE TRUE • STAY TRUE

ADOPT THE DOPP

SOWERS MANUFACTURING CO., 1302 NIAGARA ST., BUFFALO, N. Y.



Model No. S-3
(8" in Diam.—3 Filter Plates)
Area 1 Sq. Ft.
Cake Space 144 Cu. In.

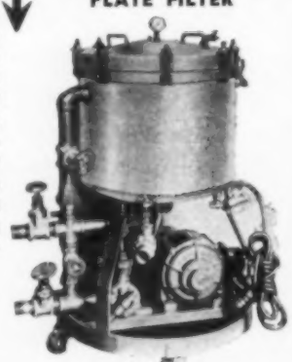
TEST WITH THIS FILTER ← in the LABORATORY

★ Chemists in the laboratory have successfully found the answer to scores of filtering problems; whether it's the heaviest wax or most volatile chemical this Sparkler Lab. Filter can do the job faster, better and at lower cost.

PRODUCE WITH THIS FILTER IN THE PLANT

SPARKLER HORIZONTAL PLATE FILTER

★ Sparkler production filters, duplicates of the laboratory model, are being used in the Chemical Industries because the horizontal design permits intermittent filtering without disturbing clarity of filtration; plates are streamlined to reduce friction and increase flow rates; completely enclosed, no leaking; builds and holds larger cake, longer filtering cycle; unfiltered residue eliminated.



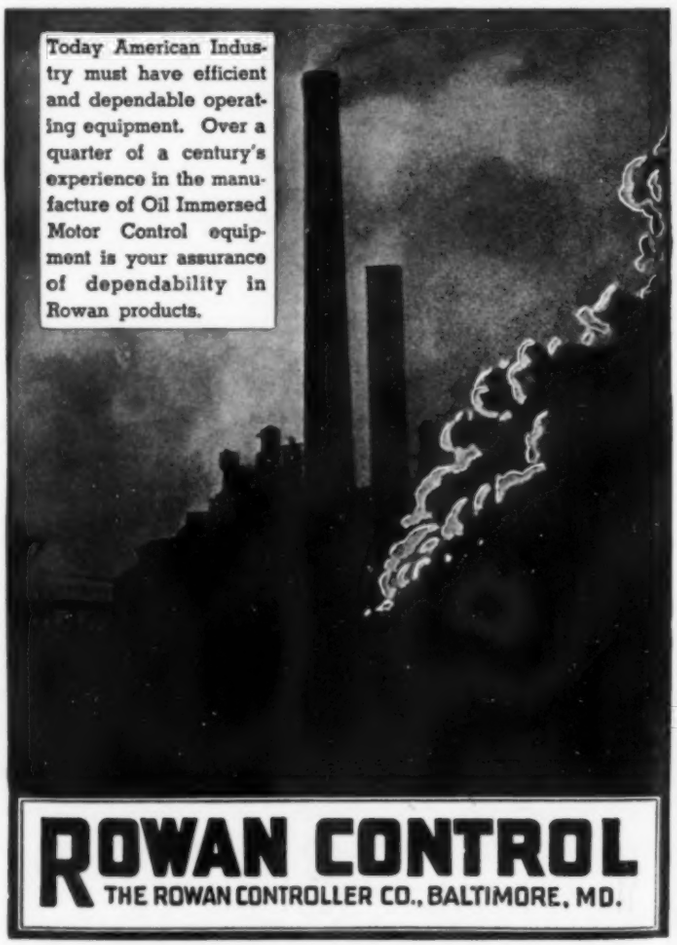
Model No. 18-13
(18" in Diam.—12 Filter Plates)
Area 20.73 Sq. Ft.
Cake Space 3 Cu. Ft.

CLEANING TIME CUT IN HALF

Other models with capacities to 10,000 G.P.H.

WRITE FOR DETAILS

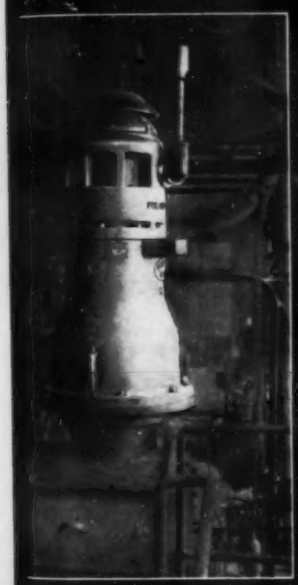
SPARKLER Manufacturing Company
205 LAKE ST. MUNDELEIN, ILL.



Today American Industry must have efficient and dependable operating equipment. Over a quarter of a century's experience in the manufacture of Oil Immersed Motor Control equipment is your assurance of dependability in Rowan products.

ROWAN CONTROL
THE ROWAN CONTROLLER CO., BALTIMORE, MD.

Horizontal MotoReduceR with PlaneTorque feature.



rtical PlaneTorque MotoReduceR ng a horizontal mixer through a pair of bevel gears.

—and overloads cannot cause production delays where the drive is a

PLANETORQUE MOTOREDUCER

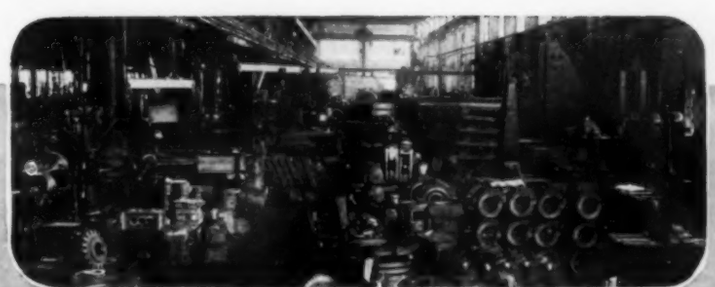
Now you can easily prevent damage to machines or driving equipment by overloading or jamming. Install a Philadelphia MotoReduceR, the compact, self-contained drive, in *either horizontal or vertical types*, provided with the PlaneTorque safety feature. This feature instantly and automatically cuts off the power whenever the load exceeds a predetermined limit. By removing the overload the PlaneTorque MotoReduceR may again be started without resetting the switch. It is the ideal drive for stokers, conveyors, mixers and other equipment where excessive loads would cause serious damage to expensive machinery.

Write today for the MotoReduceR Catalog that gives complete information.

PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS AND SPEED REDUCERS
IMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

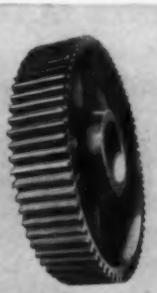


Philadelphia **LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.

Philadelphia **WORM GEAR SPEED REDUCER** right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

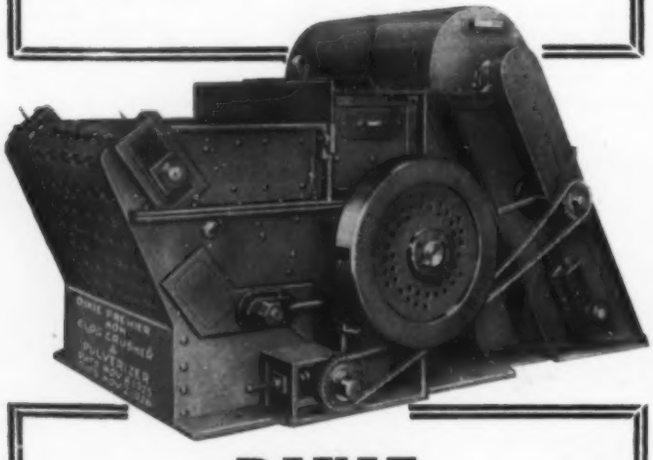
Philadelphia **MOTOREDUCER** The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia **HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.



Philadelphia **GEARS** All types and sizes of industrial gears. Can be supplied in all materials.

WHEN PRODUCTION CANNOT LAG DIXIE *Gets the Call!*



DIXIE
NON-CLOG
HAMMERMILLS

NOTE THESE TYPICAL TOUGH JOBS LICKED BY DIXIES . . .

1. Replaced four crushers for high moisture content bauxite . . . cut power in half . . . reduced drying costs . . . increased production.
2. Efficiently crushing clay balls to reclaim phosphate in Florida phosphate plants.
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HERE'S WHY

The Dixie Non-Clog Hammermill is the only crusher with a moving breaker plate. Provides positive mechanical feed. No manual pushing of material needed. Even the most plastic, wet, clayey material will not slow production or clog hammers. This feature alone has saved the cost of 10 men in one company!

And with the patented Dixie adjustable back end, the entire back of the mill can be moved towards or away from the hammer points to prevent clogging, control quality and size of product.

These are but two of Dixie's outstanding features. Send coupon below for free booklet, "More Efficient Crushing of Raw Materials" which gives complete facts.

DIXIE MACHINERY MFG. CO.
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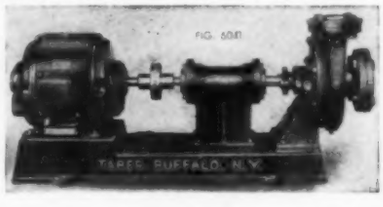

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Work closely with your fabricator. He may be able to tell you where the scarcity is . . . and may be able to show you how to bypass it.

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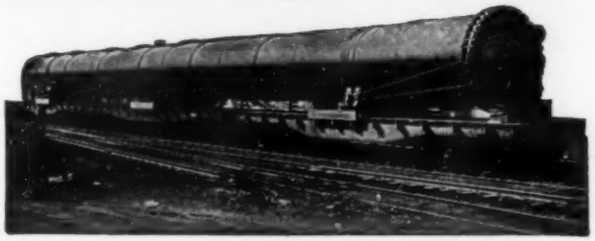

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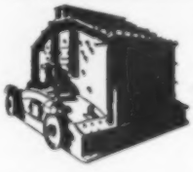

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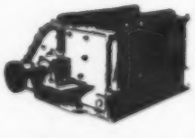

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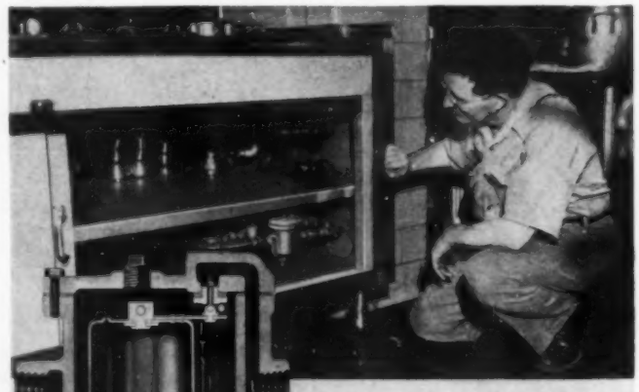

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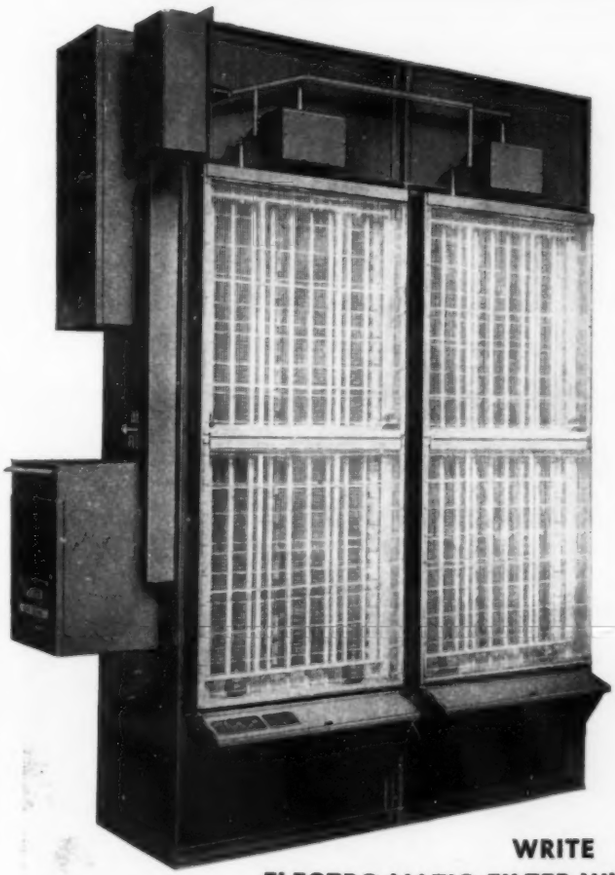
The ELECTRO-MATIC *Filter* *is* FIRST



Greatly accelerated production for the war emergency has made clean air an industrial necessity. Especially is this true in chemical plants where contamination by dust, soot, smoke, or other foreign air borne particles must be carefully controlled.

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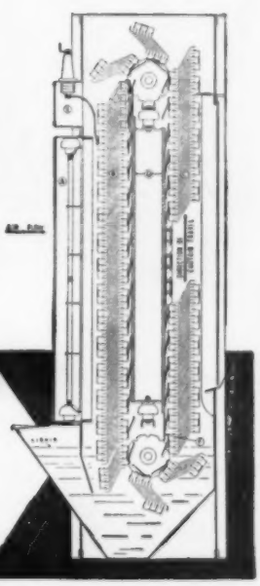

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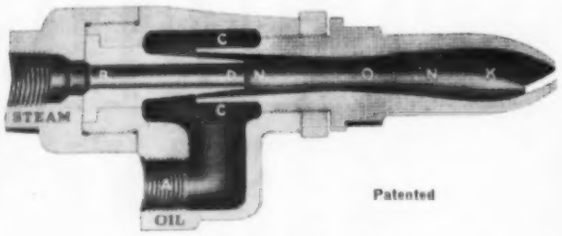

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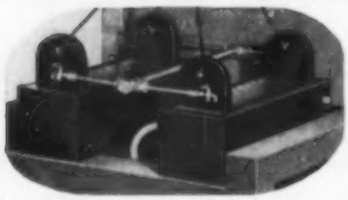

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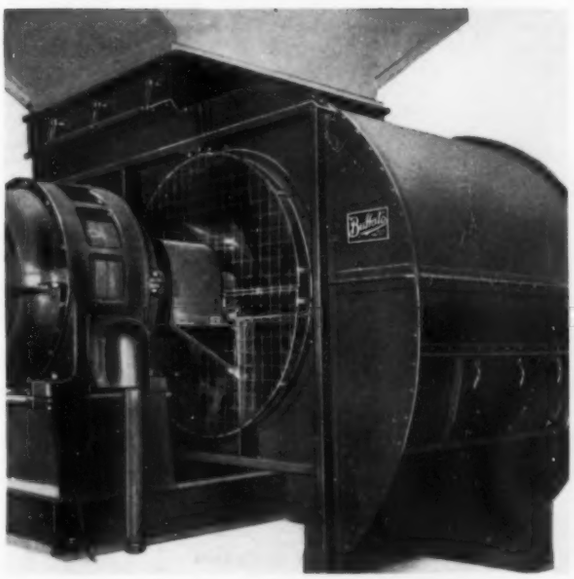

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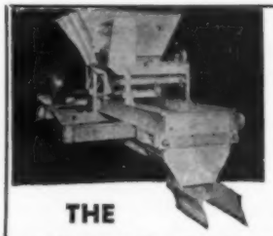

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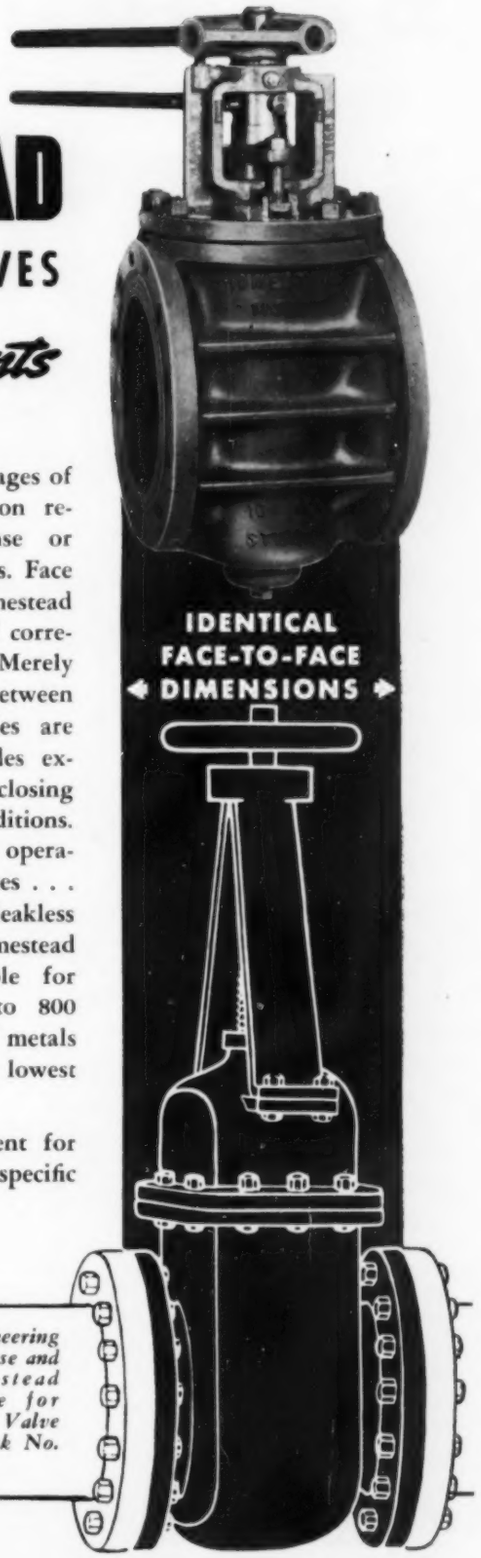

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Write our engineering department for recommendations to meet your specific needs.

For engineering facts about these and other Homestead Valves, write for your copy of Valve Reference Book No. 38.

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with any of the following experience:

1. Petroleum refinery experience in operation or design of stabilizers, absorbers and light end equipment.
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3. Refinery experience in design or operation Thermal or Catalytic Cracking Plants.

In reply state education qualifications and refinery experience in detail. Also salary expected and status regarding military service.

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CHEMIST with knowledge of arsenicals to take charge of production and research. Should also know something in regard to the manufacture of paints. Good salary and an excellent opportunity for advancement. P-369, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

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CHEMICAL ENGINEERING EXECUTIVE. Successful experience with large manufacturing corporation both in East and on West Coast as research director, technical director and as consultant. Qualified for organization and management of technical department including research, or for special investigations of new processes or applications of products. Experienced with wide variety of products. Registered patent attorney. Ph.D. Numerous patents and publications. PW-372, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

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Can be split into two Dryers.

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1—Bronze 24"x24" FILTER PRESS, 40 Chambers.
4—WALKER SWENSON JACK CRYSTALLIZERS, 4 sections, each 10' long.
3—ROTARY KILNS: 8'x12'; 6'x60'; 2'x18'.
1—BUFFALO 1600 gal. Reducer.
8—PEBBLE MILLS: 1—Patterson, 6'x7' Silex Lined; 1—32"x42" rubber lined; other sizes.
16—VIBRATING SCREENS: TYLER HUMMER 4'x5' No. 39; ALLIS CHALMERS 4'x8'; LEAHY 4'x7'; KENNEDY 3'x10';—*All double deck.*
5 RAYMOND PULVERIZERS; *5 Roll High Side;* No. 1 Beater Type; No. 0000.
5 HARDINGE CONICAL BALL MILLS: 4'6"x16", 6'x16", 8'x30". *All Iron Lined;* 1—6'x22" *Silex Lined.*

7 BELT CONVEYORS: 20"x28', 52'; 24"x105', 53', 170'; 30"x132'. Also 6—16" with *Belts Ball Bearing Idlers,* steel frame work drives, etc. 100', 120', 125', 150', 185', all c.c.
8—W. & P. jacketed and unjacketed MIXERS sizes to 500 gallons.
10—EVAPORATORS—single, double, triple and quadruple effects, standard makes.
1—150 gal. ALUMINUM JACK KETTLE; 2—80 gal., 1—60 gal., 2—40 gal.

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39—Vertical, 12' dia. x 15' high, 3" staves, closed heads, 13,000 gal.

42—Vertical, 12' dia. x 8' high, 2" staves, 10,000 gallons.

20—Horizontal, 10' dia. x 23' long, 3" staves, 14,000 gallons.

3—250 Ton Vilter Ice Machines, with 500 HP synchronous motors.

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BOTTLING EQUIPMENT

Miscellaneous: M G Sets, Kettles, Boilers, Pumps, Keg Equipment, Air Compressors, Copper Piping, Rubber Tubing, Tons of Pipe, Valves and Fittings.

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10—300 gal. COPPER CLOSED TIN-COATED TANKS.
3—ANDERSON #1 EXPELLERS.
1—ALUMINUM TRUCK TANK, 1100 gal., 10' 4" long.

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10—American Tool 40" steel basket CENTRIFUGALS, bottom discharge.
35—CENTRIFUGAL EXTRACTORS, 12" to 72", bronze and steel baskets, belt and motor drives.

1—DEVINE 8-shelf VACUUM SHELF DRYER, each shelf 30"x45"; 1—DEVINE #11, 17—40x43" shelves.
6—ATMOSPHERIC DRUM DRYERS; 1—4'x12' dbl. drum; 1—3'x7' dbl. drum; 4—Anco 4'x9' single drum; 1—4'x8'.
9—ROTARY VACUUM DRYERS; 1—BUFFALO 5'x30'; 5—DEVINE 4'x25'; 1—DEVINE 4'x30'; 1—BUFFALO 3'x10'; 1—STRUTHERS WELLS 30"x12'.
9—ROTARY DRYERS; 3'x20', 4'x30', 5'x30', 6'x40', 8'x60', 8'8"x85'.
1—ROTARY VACUUM DRUM DRYER, 48"x40". Buffalo, bronze drum, bronze lined casing; 1—DEVINE 3'x9', bronze drum.

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12—50 Ton Cap. Battleship Gondolas.
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STEAM: 49, 310, 528, 1300 & 2200 Ft.

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20—Std. Ga. 12 Yd., 14 Yd., 20 Yd. & 30 Yd. Cap.

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10x8, 13x7½, 14x7, 15x9, 15x10, 16x9, 16x12, 16x18, 18x11, 20x8, 20x6, 20x10, 20x12, 20x11, 36x15, 36x9, 36x6, 38x18, 36x10, 36x24, 42x9, 48x36, 60x42, 84x66, 36x16, 9x36.
30x10 Gruendler Roller Bearing.

HOISTING ENGINES

7 Gasoline 15, 40, 60 & 100 H.P.
17 Steam 7x10, 8¼x10 and 10x12.
8 Electric 20, 35, 50, 60, 100 & 150 H.P.

STEEL TANKS

2—18000 Gal. Horizontal Storage.
15—R.R. Car Tanks 8,000 & 10,000 Gal.

DRYERS

P. & S.—3 unit 32 ft. chemical loop dryer.
80"x65 ft. Christie Indirect heat dryer.
8'x84 ft. Ruggles-Coles double shell dryer.
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5'x60 ft. Traylor Direct Rotary Dryer.
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REDUCTION MACHINERY

2 ft. & 4 ft. Symons Cone Crushers.
5 Roll Raymond low side mill.
2 roll Raymond high side mill.
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6'x6' Screening ball mill.
4'x7' Air swept tube mill.
5½x20 Tube Mill, mang. lined.
5x22 Tube Mill with balls and motor
5'x36' Compartment mill.
4'x10' Marcy rod mill.
24x20 Jeffrey R hammermill.
24x18 & 20x12 Jeffrey A hammermill.
#38 American ring roll mill with 60 H.P. motor.

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1—**Devine 4'x30' Rotary Vac. Dryer.**
1—**Stokes 3'x15' Rotary Vac. Dryer,** complete.
1—**Day #30 Imperial Mixer,** Jacketed.
1—**#2 Oliver Duplex Vac. Pump** 14"x8".
4—**Gehnrich Indirect Gas Fired Dryers.**
3—**Tolhurst Centrifugals,** 26", 32" & 40".
4—**32"x32" Iron Filter Presses.**
3—**Sweetland Filters,** #5, #7, #8.
1—**Link Belt 75' Slat Conveyor,** (36" wide) M.D.
1—**Bauer 22" Attrition Mill.**
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1—**Pennsylvania Vac. Pump,** 14"x5".
12—**Iron & Wood Filter Presses,** 6" to 48" sq.
18—**Glass Lined & Steel Tanks** up to 4000 gals.
6—**Vertical Jack Steel Kettles** up to 500 gals., some agitated.
1—**Jeffrey 24"x18" Type A Hammer Mill.**
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20—**Copper Jacketed Kettles.**
2—**Worthington 12"x12"x12" Vac. Pumps.**
2—**#0 & #1 Raymond Mills.**
6—**Williams & Jay Bee B.B. Hammer Mills.**
3—**Single & Double Roll Crushers.**
10—**Pebble & Jar Mills,** Lab. to 750 gals.
1—**Stedman 42" Ball Bearing Disintegrator.**
3—**Ross & Lehman 3 Roll Mills.**
6—**Day & Ross Pony Mixers,** 8, 15 & 40 gals.
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2 Devine 5' x 30' Rotary Vacuum Dryers
1 Stokes 30" x 12' Rotary Vacuum Dryer
1 Proctor & Schwartz Truck Dryer 5' x 7' x 6'
1 Gehnrich Truck Dryer 3'6" x 4'6" x 12'

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1 42" x 48" Nickel Jacketed & Agitated Vacuum Still
1 Pfaudler 48" x 66" Glass and Lead Lined Vac. Still
1 Copper Jacketed Vac. Pan 3'6" x 8' with coils
1 Copper Jacketed Vac. Pan 7' x 9'8" with accessories
2 Copper Columns; 23' high and 33' high

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1 Reid Double Arm, double geared Dough Mixer 4 Bbl.
1 W.&P. Baker Perkins 150 gal. Jkted. Vat, Type Mixer
1 W.&P. Universal Unjkted 200 gal. Size 17 x BB Mixer
20 Steel Mixers from 200 lb. to 3000 lb. some with sifters
3 Jacketed Very Heavy Duty Mixers 2000 lb. capacity
1 Day Jumbo Jacketed Mixer 450 gal. capacity
1 Abbe Mastoden Jacketed Mixer No. 9, 200 gal.

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1 Horizontal Steel Tank formerly fuel oil, 25,000 gal.
5 Horizontal Steel Tanks, manhole type, 14,000 gal. each
2 Stainless Steel Horizontal Tanks, insulated; manhole
1 Glass Lined Truck Type storage Tank, 1250 gal.
4 Vertical Pressure Tanks 4000 gal.; 8' x 10'

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2 Aluminum Jacketed Kettles 300 gal. each
Large Stock of Copper Jacketed Kettles from 10 gal. to 600 gal.
2 Heavy Duty Steel Jacketed Kettles 125 gal. with agitators
3 Jacketed Cookers or Kettles 1300 gal. 5' dia. x 10' high

PONY MIXERS, POST MIXERS, LEAD MIXERS

8 gal.; 15 gal.; 25 gal.; 50 gal. standard makes

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(Large stock, all sizes)

1 Sperry 36" x 36" 42 plates
1 Sperry 42" x 42" 57 plates

CENTRIFUGAL EXTRACTORS

4 Sharples Vapor Seal Portable Clarifier Units
Troy, American, etc., Laundry Type from 20" up
Tolhurst 40" Steel, Copper or rubber lined baskets

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Sweetland Nos. 2, 5 and 7
Oliver 1' x 3' cast iron
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Many Others Scientific, Alsop, Kiefer, etc.

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Large size New Jersey Labelrite Labeler
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1—**Rotary Kiln or Dryer, 8' dia. x 90' long, with 2 supporting tires and driving mechanism.**

1—Adt Atmospheric Flaker, drum 3' dia. x 6' motor driven, with motor and knife grinder.

1—Rotary Dryer, indirect heating type, with inner tube, 2'x12'.

1—Rotary Dryer, 5½' dia. x 50' long.

1—Indirect Rotary Dryer, 6' dia. x 39' long, stainless steel and monel lined with fan.

1—Buflovak Vacuum Drum Dryer, 24" x 20", with aluminum housing.

1—Buflovak Vacuum Drum Dryer, drum 48" x 40".

2—Hersey Hot Air Dryers or Granulators, 5' x 25', 6' x 25'.

1—Rotary Dryer, direct heat, 5' x 35'.

2—Herreshoff Roasting Furnaces, multiple hearth.

4—**Proctor & Schwartz Atmospheric Tray Dryers, 5' x 6' x 7' high.**

1—**Atmospheric double Drum Dryer, 4' dia. x 9' face.**

1—**Black and Clawson Atmospheric Double Drum Dryer, 3' x 8'.**

1—Rotary Dryer, 3' x 10'.

1—**Rotary Kiln 7'6" x 7' x 125'.**

1—**Rotary Kiln 8' x 125'.**

1—**Allbright Nell 5' x 6'8" Chilling Roll, motor driven.**

CENTRIFUGALS—CENTRIFUGES

6—**Sharples No. 6 Belt and Motor Driven Centrifuges, open type.**

1—**Sharples No. 6, closed type, Pressure-Tite Centrifuge.**

4—De Laval Centrifuges, Nos. 200, 300, 600, 700.

3—Tolhurst 40" suspended type Centrifugals, bottom discharge, with 15 HP motors.

1—**Battery of 2 Tolhurst 40" suspended type Centrifugals, direct motor driven. Solid copper baskets.**

1—Tolhurst 40" suspended type Centrifugal, solid basket, motor driven.

4—Tolhurst (American) 32", 40", 48", self-balancing type Centrifugals, copper and steel baskets.

3—**Motor Driven 60" Centrifugals with rubber covered baskets.**

KETTLES—CRYSTALLIZERS—AUTOCLAVES

2—**Devine Kettles, jacketed, agitated, 1000 gal.**

1—Day Kettle, jacketed, agitated, 250 gal.

2—**Cast Iron Vacuum Crystallizers,**

3—**Buflovak, jacketed, closed, steel Kettles, 42" dia. x 60" deep I.D., with hinged heavy cover, good for vacuum or pressure.**

25—Copper, steam jacketed, Kettles, 10 to 300 gals.

5—Steel, jacketed Kettles, agitated, 50 to 500 gal.

2—Pfaudler Vertical, jacketed, welded, closed top Kettles, 1000 gal. capacity each.

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1—**Wedge Rotary Furnace, 22'6" dia., 10 hearths**
2—**Allis Chalmers 500 KW 3/60/480 volt, condensing and non-condensing Turbo Generator Sets**
2—**Heine Type O'Brien Boilers, 357 HP, 175# pressure, with stokers**
2—**Traylor Glass Smelting Furnaces, 36" x 72" and 108"**
3—**Electrolytic Generators, from 900 to 2000 amps.**
2—**Jewell Water Filtering Plants, 500 gpm**
1—**Rotary Continuous Filter 6' x 4'**
13—**Lead and Lead Lined Pumps 2" to 3"**
1—**Colorado Ball Mill 6' x 4'**
3—**Austin Gyratory Crushers, 2—#3, 1—#5**
1—**Denver Engineering Crushing Roll 36" x 16"**
2—**Chisholm Boyd and White Briquetting Machines**
1—**American Saddle Type Locomotive, 35 ton, standard ga., with ASME Boilers**
3—**Westinghouse Baldwin Electric Mining Locomotives**

Only partial list. Send for complete bulletins.

FILTER PRESSES—FILTERS

2—**Oliver United 36" x 36" Cast Iron, Filter Presses, having 41 plates and 42 frames 1½" cake.**

10—Kilby 30" x 30" Cast Iron, recessed Filter Presses, open delivery, each having 38 plates.

1—Oliver Filter, 3' x 2', cast iron.

1—Sperry 36" x 36" Cast Iron Filter Press, having 48 plates and frames making 1" cake, open delivery.

10—Shriver Sperry Filter Press Skeletons 12" to 36".

10—Shriver Cast Iron Filter Presses, 12" to 36".

1—Portland Filter 12'6" dia. x 11'9".

3—**Oliver Filters, 11'6" dia. x 8' face, steel troughts wood stave.**

2—**No. 5, 7 Sweetland Filters.**

1—Sperry 18" x 18" Filter Press, with rubber covered plates and frame.

PULVERIZERS—GRINDERS

1—**Raymond 5 Roll, High Side Roller Mill, motor driven, with double whizzer, cyclone dust collector, motors, fan, etc.**

1—**Raymond 3 Roll, High Side Roller Mill, with 5' double cone air separator, 8' cyclone collector, fan, pneumatic feed control, and piping.**

1—Hardinge Ball Mill, 3' x 8".

2—Sturtevant Jaw Crushers, 2" x 6" and 8" x 10".

5—Williams, Jay Bee Hammer Mills.

3—Abbe Cutters, sizes "00" to 1.

15—Abbe & Patterson Pebble and Ball Mills, from laboratory to 500 gal.

2—Raymond Impact Pulverizers, No. 0000, late type, ball bearing.

5—Impact Pulverizers, Nos. 0000, 000, 00, 1 and 3.

1—**Raymond No. 00 Screen Pulverizer, motor driven.**

1—Mikro-Pulverizer, 24", model 4TH, with 50 HP motor.

FILLING & PACKAGING EQUIPMENT

12—Kiefer, Pneumatic Scale, U. S., Alsop, Bottle Fillers, vacuum and gravity, automatic and semi-automatic, rotary and straight line.

3—Kiefer Visco Fillers, Piston & Gear Type.

9—World, Ermold, National, Burt, Knapp Bottle and Can Labelers.

2—World, International Automatic Straight-Away Labelers.

5—Kiefer, Stokes, U. S. Bottle Washers.

3—Knapp Compression Units.

MIXERS

2—**J. H. Day No. 30 Imperial Mixers, steam jacketed.**

2—**J. H. Day Hercules Jacketed Mixers.**

1—**J. H. Day Cincinnatus Mixer, 100 gal.**

2—Laboratory Mixers 2½ to 9 gals.

5—Day Change Can Mixers, to 80 gal.

20—Day, Robinson, Dry Powder Mixers, 25 to 1500 lb.

MISCELLANEOUS

10—Vertical Juice Heaters, 500 sq. ft.

2—Sutton, Steele and Steele Pneumatic Concentrating Tables.

1—Diester No. 6 Concentrating Table.

12—Glass Lined Storage Tanks, 50 to 1000 gal.

5—Rotex Sifters, screens 20" x 48", 40" x 56", 40" x 84", single, double and triple deck.

4—U. S., Eppenbach Colloid Mills, ½ to 3 HP.

2—Belt Conveyors, 16" x 50' and 56'.

Rotary, Centrifugal and Vacuum Pumps; Steel Pressure and Storage Tanks.

VACUUM PANS—STILLS—EVAPORATORS

1—**Copper Column, 36", 33' high, bubbler type.**

5—**Copper Vacuum Pans, 50 to 700 gals.**

1—Badger 18" Copper Rectifying Column

1—**Elyria 100 gal. Glass Lined Vacuum Pan agitated.**

1—Closed, Steel Jacketed Still, 5'6" dia. x 8'9" high on straight side, dished top and bottom.

1—**Lead Lined Single Effect Evaporator with multiple effect economy, condenser, etc., 525 sq. ft. surface.**

1—Oat Standard Vertical Tube Type Triple Effect Evaporator, approx. 2400 sq. ft. in first and second effects, approx. 1900 sq. ft. in third effect, copper tubes, and condenser.

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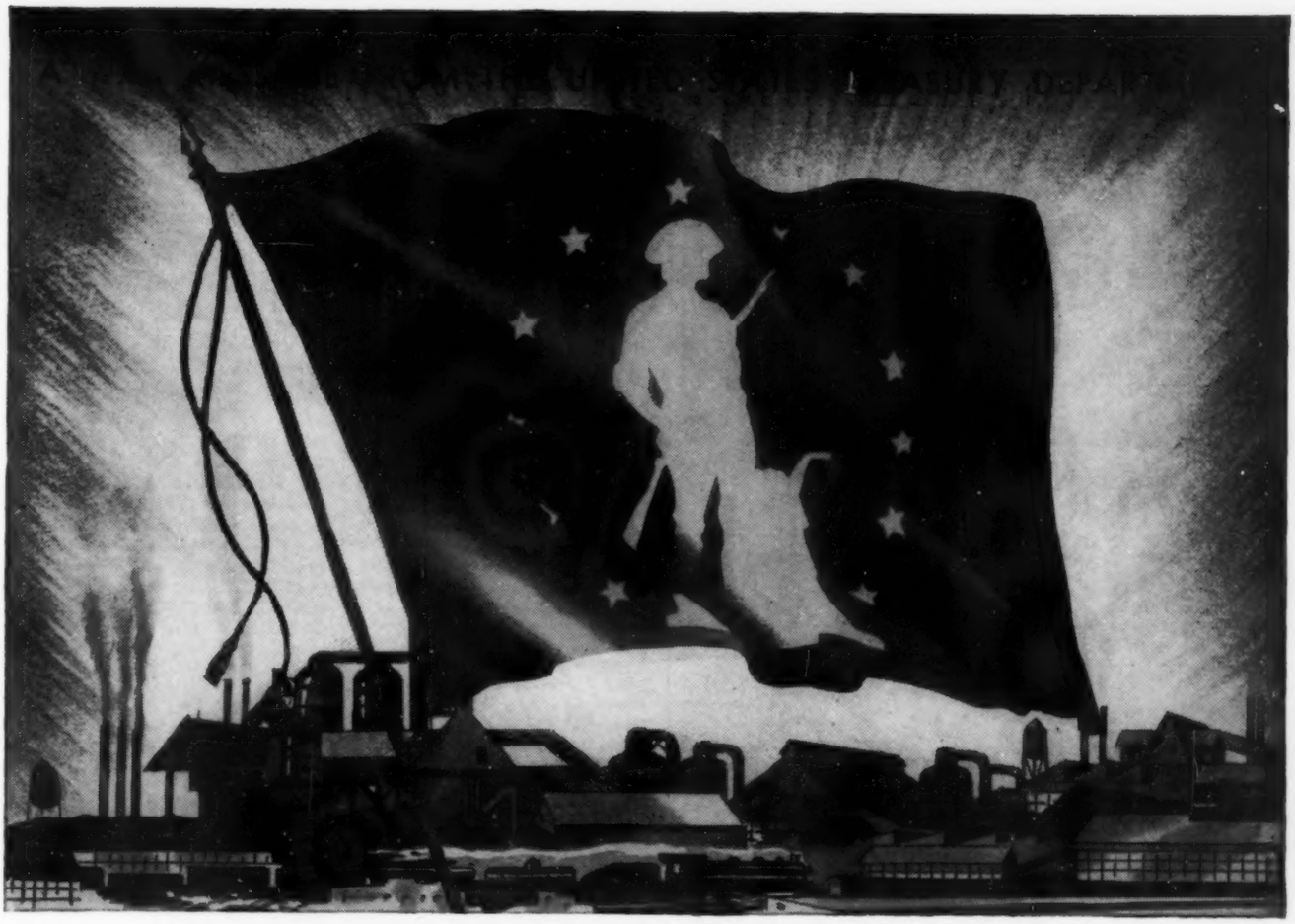

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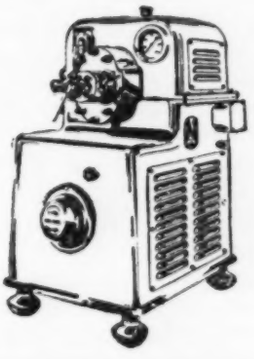

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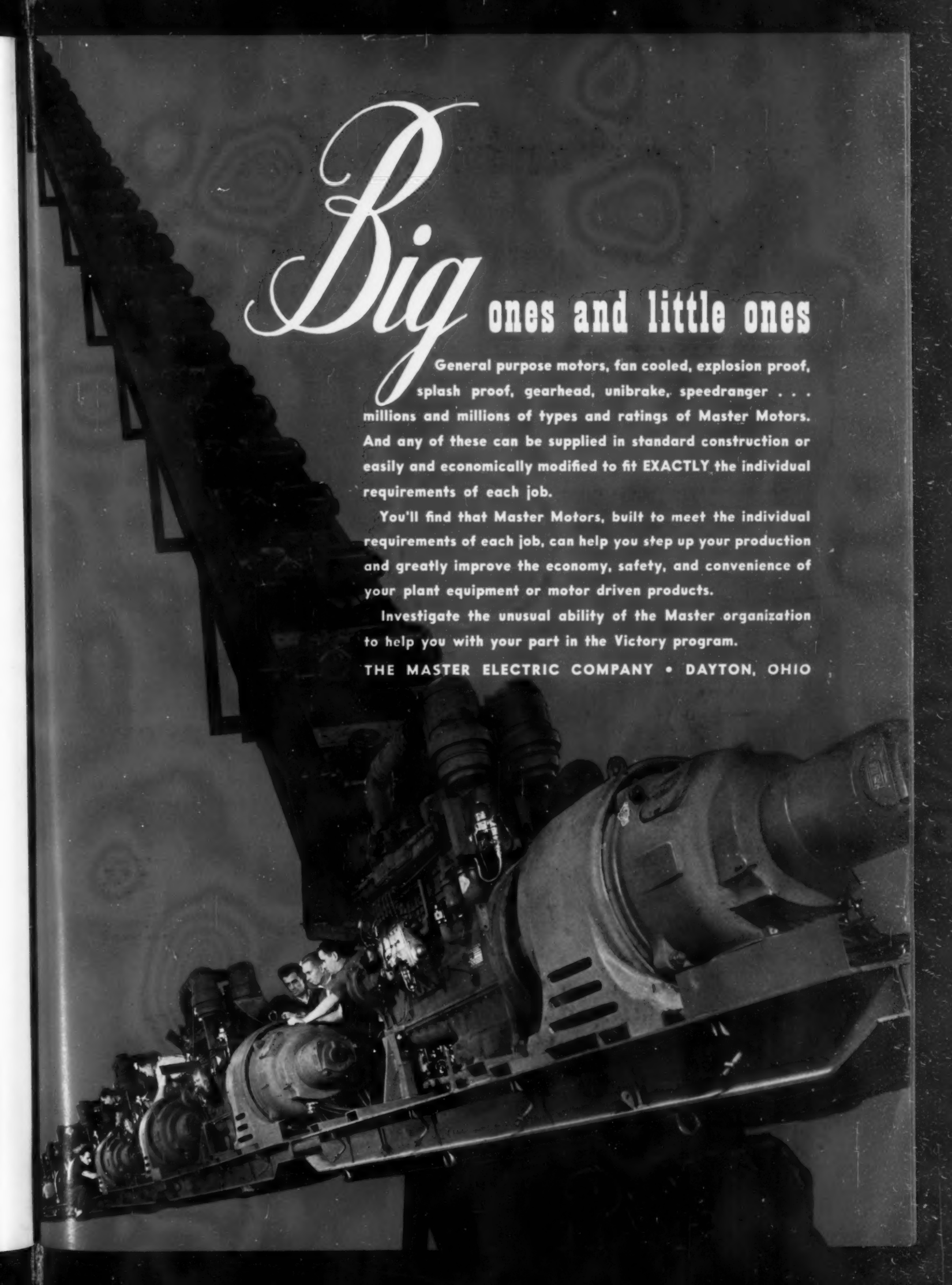
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